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ABSTRACT

The bibliography contains 75 annotations of empirical studies (1958-1974) on the psychomotor training and development of young handicapped children (1-19 years old). Studies are organized in two ways: alphabetically by author, and diagrammatically according to research thrust. The research thrusts (followed by the number of studies in each area) are: intervention through programs of physical education (17); perceptual-motor training (14); patterning for neurological organization (4); intervention through behavior modification (9); comparative-descriptive studies (15); and correlational studies (5). Summaries which review the research in each area are provided. Entries usually include the following information: author, title, source, date, pagination, rationale, subjects, method, results, and conclusions. (Author/LS)

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ROUNDTABLE IN RESEARCH
ON THE PSYCHOMOTOR DEVELOPMENT
OF YOUNG HANDICAPPED CHILDREN

Annotated Bibliography

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INTRODUCTION

This document has been prepared with two basic purposes in mind. First, an effort has been made to develop a comprehensive annotated bibliography of empirical studies on the psychomotor training and development of young handicapped children. Approximately two hundred studies were reviewed from a wide variety of resources and seventy-five of these were selected for annotation.

Annotations were limited to studies of an empirical nature, i.e., investigations in which specific data gathering processes were implemented in efforts to answer clearly specified research questions. Reports which were limited to program descriptions were not included.

The approach to annotation was designed to best serve the purposes of the Roundtable participants and the members of the audience. In general, the annotations are considerably longer than typically provided and include detail which would only be of interest to those involved in research activity. The intent was to provide annotations which would be of practical use to those who are presently involved or those who anticipate involvement in research in this area. Each annotation provides all of the essential features of the investigations as reported.

An important feature of the annotation process that should be noted is the effort made to preserve the intent and wording of the investigator(s). The approach to annotation might be called ''purposeful-selective-begnign-plagerism''. In short, the annotations are composed of sequential selections of sentences and phrases from the actual wording of the research articles. This approach helped to restrict the biases of the reviewer and preserve the meaning and intent of the original investigator(s).

The second major purpose of this document is to set the stage for the development of a state of the art message with respect to research on the psychomotor training and development of young handicapped children. This has been accomplished through the comparative review of the studies presented in the annotated bibliography and an attempt by the reviewer to highlight the apparent gaps in research in this area. This effort is designed merely to stimulate thinking for the Roundtable discussion. Subsequent to the Roundtable presentations and discussion, a final state of the art message will be developed which will reflect the views presented here and the knowledge and informed opinion of the Roundtable participants.

A diagrammatic summary of the annotated studies is presented on the following pages. This summary is intended as an ''advanced organizer'' for the reader's approach to the annotations. A brief study of the diagram will provide a valuable frame of reference for the examination of individual annotations.

The studies in the diagram have been organized according to five basic research thrusts, each of which combines specific combinations of research design and selection of variables. The research thrusts are:

1) Intervention through programs of physical education
2) Perceptual-motor training
3) Patterning for neurological organization
4) Intervention through behavior modification
5) Correlational studies
6) Comparative-descriptive studies

Following the diagram, each of the research thrusts are discussed in terms of their contribution to our knowledge of psychomotor functioning of young handicapped children.

DIAGRAMMATIC SUMMARY OF THE ANNOTATED STUDIES

The number in parentheses following the designation of investigator and date of publication refers to the number of the annotation. The explanation of the code abbreviations used in the diagrammatic summary may be found at the end of the diagrams on page 10.

I. Intervention Through Programs of Physical Education

	Nature of Handicap	Number of Subjects	Age Range of Subjects (Years)	Control Group	Independent Variable	Dependent Variable	Duration of Intervention (weeks)	Length of Training Session (Minutes/Session)	Times/Week of Training Session	Findings
Auxter, 1971 (7)	PR	12	12-30	NC	PE	MS,MF	NA	NA	NA	+
Bundschuh, etal, 1972 (11)	EMR,TMR	26,14	5-19	NC	PE	MS	4	NA	5	+
Chasey, etal., 1974 (13)	TMR	44	10-19	H+C	PE	SC	5	60	5	±
Chasey & Wyrick, 1970 (14)	EMR	32	6-12	C	PE	P	15	60	5	-
Chasey & Wyrick, 1971 (15)	EMR	47	6-12	C	PE	MS	15	60	5	±
Corder, 1966 (16)	EMR	24	12-17	H+C	PE	A,MF,SC	4	120	5	±
Funk, 1971 (20)	TMR	36	8-18	C	PE	MF	11	30	5	±
Johnson, etal., 1968 (32)	BD, ED, EMR	15,28 31	4-17	NC	PE	SC	6	60-120	2	+
Leithwood & **Fowler**, 1971(38)	DIS	24	4	H+C	PE	MF,MS,SC	15	30(max)	3	+
Lillie, 1968 (40)	EMR	43	4-6	C	DPE	MS	20	NA	NA	±
Oliver, 1958 (52)	EMR	40	12-15	C	PE	MS,MF,A,SC	10	150	5	+
Ross,D.,1970 (60)	EMR	40	4-10	H	PE	A,SP	36	20	5	+
Ross, S.A., 1969 (61)	EMR,N	40,20	4-10	C	PE	MS	24	20-25	3	+
Rarick & Broadhead, 1968 (57)	EMR, BD	275,200	elementary	H+C	PE	MF,A,SC,SP	20	35	5	+
Shotick & Thate, 1960 (65)	EMR	7	10-14	NC	PE	MS, SP	12-Develop; 16-Measure	NA	4	+
Solomon & Pangle, 1967 (68)	EMR	42	13-17	C	PE	MF	8	45	5	+
Webb, 1969 (74)	PR	32	2-17	NC	PE	P,MS,SP	8	60	4	+

II. Perceptual Motor Intervention

	Nature of Handicap	Number of Subjects	Age Range of Subjects (Years)	Control Group	Independent Variable	Dependent Variable	Duration of Investigation (weeks)	Length of Training Sessions (Minutes/ Session)	Times/Week of Training Sessions	Findings
Alley, 1968 (2)	EMR	48	7-10	C	PMT-F	MF,P,A	8	30	5	-
Hall & Deacon, 1970 (25)	TMR	60	8-19	C	PMT-F	P	28	90	5	±
Pryzwansky, 1972 (55)	N	559	NA - kindergarten	C	PMT, PMT-F	A,MS	13	15	5	-
Talkington, 1968 (71)	PR,TMR	100	7-18	C	PMT-F	P,MS	12	60	5	+
Alley & Carr, 1968 (3)	EMR	56	7-10	C	PMT-K	M,F,P,A	8	30	5	-
Ball & Edgar, 1967 (8)	N	30	5	C	PMT-K	SC	14	15	20	+
Edgar, etal, 1969 (19)	PR,TMR	22	3-8	H	PMT-K	SC	24-32	15-20	3	+
Goodman, 1973 (23)	OH	44	3-7	C	PMT-K	MS,P	6-10	20-30	5	-
Maloney, etal, 1970, (43)	EMR,TMR	59	NA	C+H	PMT-K	At,MS,SC	8	40	3	+
McCormick & Schnobrich, 1971 (46)	N	49	3-6	C	PMT-K	At,SC	28	30	3	+
Morrison & Puthier,1972 (50)	(M) EMR	27	NA preschool	H	PMT-K,PE	MS	24	20-30	5	+
O'Connor,1969(51)	N	92	NA 1st graders	C	PMT-K, PE	At,MS,P	24	NA	NA	±
Painter, 1966 (53)	N	20	NA - kindergarten	C	PMT-K	SC,P,L	7	30	3	+
Taylor, 1972(73)	TMR	70	10-16	C	PE	MF	24	60	3	+

III. Patterning

	Nature of Handicap	Number of Subjects	Age Range of Subjects (Years)	Control Group	Independent Variable	Dependent Variable	Duration of Investigation (weeks)	Length of training sessions (minutes)	Times/Week of Training Sessions	Findings
Cornish, 1970 (17)	perception or psychomotor	50	NA kindergarten	C	DD	P,MS	12	3	5	-
Doman, etal., 1960 (18)	BD	76	1-9	NC	DD	MS	24-80	T_1-all day T_2-5	T_1-NA T_2-28	+
Geddes, 1967 (21)	EMR	14	9-11	HC	DD, PE	MS	12	30	5	±
Kershner, 1968 (36)	TMR	30	8-18	HC	DD	MS,A	15	330	5	±

IV. Behavior Modification

	Nature of Handicap	Number of Subjects	Age Range of Subjects (Years)	# treatment groups, conditions	Control Group	Independent Variable	Dependent Variable	Duration of Investigation (Weeks)	# of Trials or sessions	Length of Training Sessions/Trials (Minutes/Session)	Times/Week of Training Session	Findings
Auxter, 1969, (5)	EMR	32	10-12	C	NA	R	MS	25	NA	20 sec.	NA	+
Bem, 1967 (9)	N	12	3-4	NA		F	VC	2-16	NA	10-15	NA	+
Goodenough & Brian, 1929 (22)	N	20	4	3		VC	MS	1000	NA	NA	NA	+
Harrison, etal.,1966 (27)	PR	40	7-15	4		VC M+PE	MS	NA	4	20	5	+
Hill, etal., 1967(28)	EMR	14	8-15	C		VC+PMT-R	P	NA	16	20	5	±
Jarvis, 1968 (30)	N	72	nursery,kindergarten, 1st grade	3		VC	MS	6	NA	5	NA	-
Johnston, etal. 1966 (33)	N	1	3	NA		R	MS	NA		NA	NA	+
Levy, 1974 (39)	EMR	80	5-10	NA		R+F	MS	30	NA	20 sec.	NA	+
Loynd & Barclay, 1970 (41)	PR	1	8	NA		R	MS	84	NA	NA	7	+
Martens, 1971 (44)	N	60	4th, 5th & 6th graders	3		R	MS	40	NA	NA	NA	-
Martens, 1970 (45)	N	50	3-5	3		R	MS	40	NA	NA	NA	-
McManis, 1965 (47)	N,EMR	48,48	NA	4		Compet,R	MS	5,5,5 NA	NA	20 sec.	NA	+
Meichenbaum & Goodman, 1969 (48)	N	84	Kindergarten 1st grade	3		VC	MS	12	NA	15 sec.	NA	+
Meichenbaum & Goodman, 1969 (49)	N	30	5-6	NA		VC	MS	NA		NA	NA	±
Paloutzian, 1971 (54)	PR	20	3-12	C		R,M	SP,MS	625	NA	NA	2-3	+
Rieber, 1968 (59)	N	192	5-9	3		F	MS	55 max	NA	NA	NA	+
Sechrest, 1968 (62)	(M) EMR,TMR	8	10-19	NA		R	MS	NA	14 da.	NA	NA	+
Solkoff, 1964 (67)	N	84	5-10	3		Fr	P, MS	NA		NA	NA	±

(Continued)

IV. Behavior Modification

	Nature of Handicap	Number of Subjects	Age Range of Subjects (Years)	# treatment groups, conditions / Control Group	Independent Variable	Dependent Variable	Duration of Investigation (weeks) / # of Trials or sessions	Length of Training Sessions/Trials (Minutes/Session)	Times/Week of Training Session	Findings
Stevenson & Cruse 1961, (69) I	N,EMR	30,30	$\bar{X} = 5.2$, $\bar{X} = 14.2$	3	R	MS	NA 5 da.	30 max.	NA	±
Stevenson & Cruse 1961, (69) II	N,EMR	72,36	$(\bar{X}-\frac{1}{2} = 12.4$, $\frac{1}{2} = 5.2)$ $\bar{X} = 15.0$	4	R	MS	NA 5 da.	30 max.	NA	±
Stoneman & Keilman, 1973 (70)	EMR	40	8-14	8	Compet., SP	MS	NA	1 max.	NA	+
Talkington, 1971 (72)	M (TMR)	60	11-17	3	F	MS	100 max. NA	NA	NA	+

V. Correlational Studies

	Nature of Handicap	Number of Subjects	Age Range of Subjects	Main Variable(s) (Criterion) Studied	Factors Considered	Findings
Groden, 1969 (24)	EMR	54	5-13	MF, A	MS	±
Hammill, 1970 (26)	Dis	166	NA Kindergarten & 1st Grade	NA	P, MS	-
Hofmeister, 1969 (29)	EMR	31	10-14	MF,MS	MA, CA A, SES, SC	+
Maccoby, etal., 1965 (42)	N	41	4-5	MAct	A	±
Smith & Hurst, 1961 (66)	TMR,EMR	18,25	8-14, 6-12	MS	SP	+

VI. Comparative - Descriptive Studies

	Nature of Handicap	Number of Subjects	Age Range of Subjects (Years)	Comparison Group(s)	Number in Comparison Group	Factor(s) Studied	Findings
Adelson & Fraiberg, 1974 (1)	B	10	0-1	N + B	NA,66	MS	+
Alley & Snider, 1970 (4)	EMR*	50*	7-10	Bl + Wh	18,32	P, MS	NA
Auxter, 1971, (6)	D*	30*	14-17	N(IQ)+UA	15,15	P, MS	NA
Boyd, 1967 (10)	D	90	8-10	N	30	MF,MS	NA
Carlson, etal., 1970 (12)	B	18*	6-11	B & Partial Sight	9,9	MS	NA
Jenkins & Lohr, 1964 (31)	SpD	40	6-7	N	40	MS	+
Keogh & Keogh, 1967 (34)	EMR	39	6-10	N	84	P, MS	NA
Keogh & Benson, 1964 (35)	UA	43*	10-14	By age, 10-12, 13-14	28,15	MS	±
Knights, etal., 1967 (37) I	TMR	38*	7-24	TMR + M	19,19	P	-
Knights, etal., 1967 (37) II	TMR	24*	10-21	TMR + M	12,12	MS	-
Rarick, etal., 1970, (56)	EMR	4, 235	8-18	N	NA	MF,MS	NA
Reitan, 1971 (58)	BD	29	5-8	N	29	MS, P	+
Semmel, 1965 (63)	EMR	42	8-15	N	42	MS,At	-
Sengstock, 1964 (64)	EMR	30	5-13	N	60	MF	±
Weninger, 1972 (75)	PH	24	11-17	N & Institutional & Home Care	8,8,8	SC	NA

*This total sample broken down into comparison groups.

CODE ABBREVIATIONS AND DESCRIPTORS

A - achievement (includes IQ)
At - attention
B - blind
BD - brain damaged
Bl - Black children
BM - behavior modification
C - control group included
Compar - comparative, descriptive or normative study
Compet - competition
D - deaf
DD - Doman-Delacato patterning
Dis - disadvantaged
DPE - diagnostic physical education
ED - emotionally disturbed
EMR - educable mentally retarded
F - feedback intervention, external cues
+ - generally positive findings
- - generally negative findings
± - mixed findings
Fr - frustration
H - Hawthorne control group
La - language, speech
LD - learning disabled
M - mongoloid
MAct - motor activity
MF - motor fitness
Model - modeling
MS - motor skills
Mu - music, rhythmic
N - normal children
NC - no control group
OH - orthopedically handicapped
P - perception
PE - physical education
PEI - physical education intervention study
PH - physically handicapped
PMI - perceptual motor intervention study
PMT-F - perceptual motor treatment (Frostig method)
PMT-K - perceptual motor treatment (Kephart method)
PR - profoundly retarded
R - reinforcement
r - correlational study
SC - self concept, social adjustment, body image
SpD - speech disordered
SES - socioeconomic status
SP - social participation
TMR - trainable mentally retarded
UA - underachievers
VC - verbal control
Wh - white children

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I. INTERVENTION THROUGH PROGRAMS OF PHYSICAL EDUCATION

Seventeen studies were reviewed which implemented organized programs of physical education. In general this intervention varied from 4 weeks to 8 months and typically included motor training in gymnastics, calesthenics, gross motor games and sports and fine motor skill training.

Twelve of the seventeen studies (11, 16, 32, 38, 52, 57, 60, 61, 65, 68, 74) report consistently positive effects on motor fitness and motor skill variables from pre to post testing.

Three of the studies (15, 20, 40) show mixed or no effect on gross motor variables. The study by Lillie (40) is particularly discouraging in view of the fact that considerable effort seems to have been devoted to the development of a ''diagnostically based motor development program.'' Lillie does report signigicant pre-post improvement in fine motor skills.

The two studies (7, 74) which involved profoundly retarded subjects both report positive effects on motor fitness variables but both investigations failed to employ control groups of any kind. The studies are encouraging and further research, with appropriate experimental controls and larger sample sizes, is recommended. It is significant to note Webb's (74) comment that the younger subjects in her study (CA range from 2 1/2 to 17 1/2 years) seem to have made the greatest improvement. Although the issue of critical periods is still a controversial subject in psychology, research in this area should be conducted with a view toward the identification of optimal periods for particular modes of intervention.

Three studies (13, 32, 38) report positive influence on selected measures of self-concept and body image. Ross (61) utilized game participation skill training as a major component of a motor skill training program and attributes the success of the intervention to improvements in the subjects' involvement in the training exercises.

The comprehensive study by Rarick and Broadhead (57), comparing individual versus group oriented physical education, incorporates large samples, broad test battery and extensive operational description of methodology. The conduct of this study might be used as a model for future efforts of this nature.

The study conducted by Leithwood and Fowler (38) on normal and disadvantaged four-year-old children should be carefully examined. The study provides one of the more sophisticated theoretical frames of reference of all of the studies reviewed. In view of the dramatic effects of the theoretically derived gymnastic training program, further investigation of the theoretical model is called for. This study is unique in its recognition of cognitive factors as independent variables in the motor training process. The design of this intervention program was grounded as firmly in the cognitive development of children as it was in the physical-motor development of children. Extension of the model to more severely handicapped children is recommended.

In general, the studies of the effects of physical education training of handicapped children have produced data supportive of this form of intervention. Little information has been provided as to the comparative efficacy of various durations and intensities of intervention and virtually no data is reported with respect to the individual contribution of specific tasks included in the training programs.

II. PERCEPTUAL-MOTOR TRAINING

Fourteen studies were reviewed which were devoted to the investigation of the effectiveness of specific perceptual motor training programs on the motor functioning of handicapped children. Nine of the studies (3, 8, 19, 23, 42, 50, 51, 53, 73) cite Kephart's theory and methodology as a frame of reference and four studies referred to Frostig's program. One study (46) did not identify its frame of reference but included activities common to Kephart's approach.

Seven of the nine studies using the Kephart methodology report statistically significant pre to post changes on various measures of psychomotor function. Four of these studies (19, 43, 46, 50) included Hawthorne controls. Positive findings with respect to psychomotor function have been reported with respect to the profoundly retarded, trainable retarded, educable retarded and normals. One study (23) reported negative results when these methods were applied to preschool orthopedically handicapped children. The studies which report positive findings have included subject populations from kindergarten through age sixteen. All of the studies which were performed on preschool or kindergarten age retarded children report generally positive effects of the Kephart methodology. The studies varied considerably in length of training intervention. The range was from seven weeks to eight months with individual training sessions varying from fifteen to sixty minutes, three to five times per week. It is significant to note that the two studies which report negative findings employed the shortest of the reported training intervals (two months).

It would appear that the Kephart methodology has demonstrated some initial effectiveness with a wide range of retarded children and more detailed investigation of the specific effects of the techniques is warranted.

Four studies utilized the Frostig methodology (2, 25, 55, 71). Only one of the four studies reviewed (71) reports clearly positive effects of the Frostig Training methodology. The training in the four studies was applied to samples of EMR, TMR, profoundly retarded and normal children. None of the studies employed adequate Hawthorne controls and it must be concluded that the results do not generally support the use of the Frostig methodology as an appropriate intervention for psychomotor retardation of handicapped children.

The reviewer shares the uneasiness of many special educators with respect to the training programs which have been derived from the theoretical positions of Kephart and of Frostig. There appears to be some considerable confirmation of the Kephart methodology with respect to motor skills and motor fitness of samples of handicapped children but little confirmation of the Frostig techniques. The suggestive success of the Kephart exercises with respect to motor skills and motor fitness of samples of handicapped children cannot be interpreted as a general confirmation of the Kephart theory of perceptual motor development. The exercises may be effective for reasons other than those presented by Kephart. The programmatic basic research necessary to validate the theoretical formulations of Kephart has not been conducted.

Despite this empirical gap, it is the reviewer's view that future research must insure that the proverbial baby is not thrown out with the bathwater. If the exercises have demonstrated positive effects on motor variables this is certainly sufficient cause for their incorporation in practical application and for their further study.

III. PATTERNING FOR NEUROLOGICAL ORGANIZATION

Doman and Delacato's use of patterning procedures for the establishment of ''neurological organization'' and the facilitation of motor and intellectual development has continued to receive attention from researchers and practitioners. Four studies (17, 18, 21, 36) were reviewed which have evaluated the effectiveness of patterning techniques. Two of the studies (17, 21) have failed to support the techniques in 3-4 month intervention programs with EMR and ''perceptuomotor'' handicapped children. The study by Doman, et al.,(18) reports generally positive findings with brain damaged subjects but no controls were used of any kind. Kerschner (36), in a well controlled study using a Doman and Delacato trained teacher obtained some confirmation of hypotheses generated by the theory of neurological organization with 8 to 18 year old subjects.

In general in would be tempting to dismiss this theory and method except for the fact that the concept of neurological organization remains intuitively pleasing and there are few practical alternative therapies for cases of profound motor retardation. The basic assumption, that patterning exercises provide tactual and proprioceptive stimulation to the central nervous system which may affect the functioning of that system cannot be dismissed without the generation of appropriate data. These data have not yet been presented.

Although there is adequate justification for criticism of the uncontrolled rhetoric and anti-empirical attitude of the Institutes for the Achievement of Human Potential, there has not been a comprehensive, well-controlled study of the use of patterning procedures with young brain damaged children. Again, as mentioned with respect to the effects of the Kephart method, the contemporary state of methods for the facilitation of psychomotor development in young children does not suggest casual dismissal of promising techniques regardless of the attitude of the developers of those techniques.

IV. INTERVENTION THROUGH BEHAVIOR MODIFICATION

The investigations conducted under this general heading concentrate on the effect of manipulation of variables derived from the study of human learning. The variables which have been investigated in the studies reviewed include: the application of reinforcement to the modification of motor behavior; the use of modeling for imitation learning; the effects of informational feedback on motor performance; the effects of experimenter and subject use of verbal control on motor performance; and the effects of systematic variation of competition and frustration inducing experiences on motor performance. When compared to the preceding research thrusts, these studies are characterized by more precise operational definition of variables, measurement of specific behaviors and virtual elimination of standardized testing of subjects. Many of the studies were conducted under laboratory conditions with considerably more attention to methodological and statistical concerns than the studies cited thus far.

Nine studies (5, 33, 41, 44, 45, 47, 54, 62, 69) report on the effects of systematic use of reinforcement for the development of motor behaviors. The subjects for these studies have varied from preschool through twelve years and reinforcement has included praise, candy, attention, food, and privileges. Motor behaviors selected as dependent variables have included a wide variety of fine and gross motor skills. None of the studies reviewed addressed themselves to motor fitness variables. The studies have limited themselves to EMR, TMR,profoundly retarded and normal subjects. Seven of the studies (5, 33, 39, 41, 47, 54, 62) report generally positive effects of the use of operant procedures for the facilitation of psychomotor behaviors in the subjects studied. The study by Levy (39) is a good example of this approach and the promise the approach seems to hold for successful intervention with handicapped populations.

Three studies (44, 45, 69) report negative findings but both of the studies by Martens were conducted on normal populations. There is considable evidence that the effects of operant procedures have differential effects on various populations thus indicating that the use of this approach must be individually evaluated for the various handicapping conditions.

In summary, it is clear that the use of reinforcement procedures has been highly effective in the modification of psychomotor response within the samples of handicapped children included in these investigations. It is also clear however, that there exists a wide gap between the contemporary application of behavior modification technology with normal children and the application of that methodology with handicapped children.

V. COMPARATIVE-DESCRIPTIVE STUDIES

The investigations which have been labelled Comparative-Descriptive have selected some psychomotor variable or set of variables and attempted to establish either norms and/or group differences on those measures with specific handicapped populations. At best these studies represent a crude beginning to the quality and quantity of descriptive data prerequisite to the development of a scientific discipline. The efforts of Sengstock and Rarick, et al., are notable in their attempt to normatively describe a specific population on a pattern of motor variables. The extension of the Rarick, et al., norms to motor skill variables would be of considerable value.

The one tentative conclusion that can be drawn from these investigations is that psychomotor functioning is a highly vulnerable aspect of human development and is an omnipresent concommitant factor in a wide variety of handicapping conditions. Virtually nothing is known specifically with respect to cause and effect but the pervasiveness of psychomotor decrement in the populations studied, i.e., deaf, blind, speech disorder, EMR, TMR, mangoloid, suggests the central status of psychomotor processes.

It is important to note further that this research tells us little of the etiology of these comparative decrements and developmental research into these factors is of critical significance.

VI. CORRELATIONAL STUDIES

The five studies reviewed under this heading (24, 26, 29, 42, 66) are merely representative of a body of literature which has attempted to establish empirical relationships among variables associated with the functioning of handicapped children. The studies reviewed and annotated were included because of their specific selection of motor variables.

In general, the comments offered with respect to the Comparative-Descriptive Studies above are again applicable. The study of the relationships among the measureable characteristics of young handicapped children is barely in its infancy and the fragmentary information available at this time falls short of providing guidance for future research. Variables have been selected more on the basis of intuition and common sense than on deductive or inductive orientations to theory. The pervasive absence of unifying theoretical frames of reference in the Comparative-Descriptive and Correlational studies is their most characteristic feature and explains the limited contribution of these studies to our understanding of psychomotor functioning of handicapped children.

IMPLICATIONS FOR FUTURE RESEARCH

The following impressions are offered by this reviewer in an attempt to set the stage for the Roundtable discussion and the development of a state of the art message. A number of major gaps in the research literature have been identified and a number of promising extensions of existing research are presented. This preliminary critique will be reviewed and modified based on the information provided through the Roundtable presentations and discussions.

The most obvious and regrettable impression that emerges from the studies reviewed is the complete absence of investigations of the psychomotor development of very young handicapped children. With the exceptions of the study by Adelson and Fraiberg (1) with blind infants and the controversial work of Doman, et al., (18) no studies were uncovered in this literature review in which efforts were made to provide systematic psychomotor intervention with handicapped children from birth through age four, or to study the development of psychomotor function and/or dysfunction in this first critical stage of life. Several studies (40, 53) intervened in the fifth year of life and several additional studies (45, 22, 38, 8) assessed psychomotor variables with normal preschool children. In general it may be stated that, on the basis of this review, there appear to be no reports of investigations into the psychomotor development of handicapped children from birth to four years of age.

In view of the congenital nature of the vast majority of handicapping conditions among the populations in question, this major hiatus in the empirical base for the understanding of psychomotor functioning must be eliminated. The development of a normative-descriptive base of the course of the handicapped child's psychomotor development in these early years is an obvious starting point. This base can then be used as a frame of reference for the design of early preventative intervention strategies and curricula.

The review of literature thus far has indicated a less that adequate development of theoretical perspectives underlying the various investigations. Most of the hypotheses seem to have been generated on the basis of the researcher's intuituion and overriding faith in the efficacy of physical education and motor training as a solution to a variety of problems. This is not to say that the area is atheoretical but simply that theoretical positions have simply not been provided in the research literature reviewed and the statements of theory have not been particularly productive in organizing the research which has been conducted.

In this regard it has been noted that the descriptive work of Jean Piaget on the early psychomotor development of children has had little noticeable influence on the research reviewed. Piaget's insightful account of the sensorimotor base for the development of man's intellectual development should be pursued as a base for testable hypotheses.

A further consideration with regard to the development of a theoretical base is the growing influence of learning theory and the applied methodology of behavior modification. Although the effect of behavior modification methodologies have yet to be convincingly demonstrated with handicapped children it has been this reviewer's experience that behavior modification strategies must be adapted for each population to which it is applied. The researcher who presumes that M & M's are universal reinforcers is as naive as the child who believes that they do not melt in your hands. Those stimuli which will prove to have reinforcing properties with young orthopedically handicapped children may or may not have the same effect when applied with EMR children even if all testing or training conditions are held constant.

Schedules of reinforcement developed on the basis of pigeons playing ping-pong may have considerably different effects when applied to a mongoloid child learning to climb a jungle gym. The success of the adaptation of behavior modification techniques and theory in other fields, e.g., early childhood education, strongly suggests a comprehensive study of this theory and applied methodology in the study of psychomotor development/training of young handicapped children.

One area of special emphasis in this regard is the study of the effects of modeling and imitation learning processes in handicapped children. The impressive results obtained by Paloutzian (54) are noteworthy and extension of this research approach would appear most worthwhile.

The concepts of locus of control, reinforcement, verbal control of motor response and response inhibition have been studied through a variety of methods in a variety of child populations. The theoretical proximity of these concepts and potential value of clarification of their interrelationships for the understanding of psychomotor functioning is noteworthy and should receive some research priority. This form of basic research is essential to the long term improvement of intervention methodologies.

One major set of hypotheses which seems highly promising relates to the social consequences of increased motor functionong of handicapped children. Simply stated, normalization of motor functioning of the handicapped child appears to lead to increased social acceptability within handicapped and normal peer groups. Increased social acceptability results in increased reinforcement for participation. Increased participation in social play further increases motor and social skills which contribute again to further normalization. The combination of increased social and motor skill and improved feedback from the social environment results in improved self concept and concomittant increase in level of aspiration and other motivational factors. The studies which have researched these issues have been conducted in a remedial mode, i.e., after the handicapped child had experienced considerable social rejection and whose motor skills had already been retarded well beyond their potential. The effects of preventive mode intervention at the preschool level remain uninvestigated. It would seem however that the potential benefits from preventative programs would far outweigh after-the-fact remedial efforts.

The selection and measurement of dependent variables can only be described as a major shortcoming of the intervention literature. In general this often takes the form of selective concentration on fitness variables or skill variables, with little or no consideration for the possible interaction between these sets of factors. It would appear likely that physical fitness factors may prove prerequisite conditions to the potential outcome of motor skill training, i.e., if the child is not physically fit, he cannot adequately participate in training which has been designed to teach specific skills. Ideally any intervention program should begin by getting its children ''in shape'' prior to any attempt to intervene with motor skill training. Studies which have attempted to train in motor skills appear to have resulted in some inadvertent physical fitness spinoff but not enough and not in time to maximize the potential effects of the motor skill training. It is probably not inaccurate to speculate that many of the studies reported might have been more effective if each had immediately repeated their intervention subsequent to its initial application. The S's who had undergone the initial skill training would have shown some increase in physical fitness as a result of the motor skill training and would then be at least minimally prepared to benefit from the skill training.

A final difficulty lies in the nature of the development and description of intervention strategies and their application to the children in the course of the investigations. The descriptions of the training processes have been vague and would, in most instances, not allow for reliable replication. Although this may, in part, be due to limitations in publication of research articles, it is safe to speculate that researchers have not taken the operational specification of the physical and psychological nature of the training situation seriously.

There appears to be a major gap in the study of the learning/training environment in terms of specifics. Although Cratty (Motor Activity and the Education of Retardates, 1969) touches upon the subject and makes a series of sensible intuitive recommendations, little seems to be known with respect to the most favorable teacher/child ratios for motor training of motor skill, etc. The nature of the learning setting and all ecological considerations such as density of training situation, control of distractions, size of training facilities and content and distribution of training equipment must be studied as a set of interrelated factors which have major influence over the outcome of intervention efforts.

1. Adelson, E., & Fraiberg, S. Gross motor development in infants blind from birth. *Child Development*, 1974, *45*, 114-126.

Rationale

This paper brings together the experimenters central findings on the characteristics of gross motor development in a blind research sample. To support the early hypothesis that there is a unique pattern for normal gross motor development in the healthy blind child, they use motor items from standard developmental scales to compare the achievements of children in their group with those of sighted children. To demonstrate the effect of the intervention program they compare their group with the larger blind sample studied by Norris, et al (1957).

Subjects

The 10 blind infants in the research group joined the Child Development Project when they were between 1 and 11 months old. All the children in this group have been followed past their second birthdays. All the infants were totally blind or had no more than minimal light perception at time of referral; they had no other discernible handicaps or neurological damage.

Method

In the developmental guidance program the experimenters encouraged and promoted all those experiences in which sound and touch could bring meaning and reward. And, because the baby's human partners give the most salient meaning to all sense experience, our program was centered in the parent-child relationship. Parents were encouraged to talk to their blind baby when approaching and while holding him for feeding, dressing, cuddling, or comfort. At the same time the experimenter created settings, in the crib or playpen or at the table, where interesting playthings remained within easy reach, to encourage coordinated two-hand activity and to offer opportunities for spontaneous exploration and mastery with objects that made sounds as they were touched and manipulated. In these and other ways they aimed at building into earliest experience a sound-touch identity for people and for things. The experimenters reasoned that everything they did to promote sound-touch experience for the hands would facilitate the coordination of ear and hand in directional reach and attainment of an object. They reasoned further that everything they did to facilitate "reach on sound" would have an effect in initiating locomotor sequences. Wherever vision would normally facilitate a baby's experiments in a new posture, sound-touch experience was built in which would make the new posture "interesting" for a blind child and would lure him into postural shifts and mobility. Homes were visited twice a month. The babies were observed in such daily activities as feeding, bathing, and playing. Narrative notes of direct observations of each child were recorded in writing during the visit. In addition, film samples of gross motor and other behaviors were taken monthly.

Results for the Blind andSighted Comparison

The experimenters were interested in determining whether their earlier hypothesis held up in the completed sample, that is, that postural achievement for the blind child tends to be on schedule, whereas self-initiated mobility is usually delayed. The sequence of motor items is essentially similar for both the blind and the sighted children. Age, sex, light perception, and prematurity are not systematically related to gross motor development within this group of 10 blind children. The achievements for which blind infants were delayed beyond the sighted age range are: "elevates self by arms in prone", "raises self to sitting position", "stands up by furniture (pulls to stand)", "walks alone, three steps", and "walks alone across room". These all involve some form of what will be called self-initiated mobility. Creeping is an additional mobility item that is delayed.

Conclusions

These findings would seem to support the experimenters' earlier suggestion that blindness does not affect gross motor development in some uniform fashion. Blindness has relatively little impact upon postural achievements in the otherwise normal and well-stimulated blind infant. However, blindness is associated with a marked delay in the achievement of mobility skills. They argue from this that vision must play a more central role in the establishment of mobility and locomotion than it does in the establishment of stable postures. The prehension study indicates that for the blind child there will have to be some adaptive substitution of distant auditory stimuli for distant visual stimuli to prompt the beginnings of self-initiated mobility. This substitution, in their experience, does not occur until the end of the first year.

Results for Comparison of Two Blind Groups

The experimenters' group of 10 did resemble the Norris group of 66. The items have been arranged to correspond to the actual order of achievement of the blind children, which is slightly different from the order for sighted children. The similar regular pattern of gross motor development shown by both groups probably represents the normal developmental sequence for the child who is blind form birth and who has no other handicap. Further examination shows an age advantage for the Child Development Project children, an advantage that increases over time. The experimenters believe that the earlier ages for gross motor achievements of the children in their blind group represent the cumulative effects of the intervention program. Delays in mobility and locomotion were lessened when they were successful in providing early auditory-tactile experiences that sustained interest in the external world, encouraged physical activity, and ultimately permitted sound to serve as a lure for forward progression.

Conclusions

The experimenters are not concerned with the simple performance of any motor item for its own sake. There are children with severe motor handicaps who develop adequately in most other areas. For the young blind child, however, anything that further restricts his already limited access to external stimulation is of great moment because it may prevent his acquisition of objective information about events and objects around him, and it may encourage a dangerous passivity and subjectivity, thus threatening all of early ego development. The blind child's special pattern of gross motor development claims our attention because the periods of delay that are "normal" for the blind child probably represent periods of serious developmental hazard. If the blind child is provided with good mothering and the chance to become familiar with many body positions, and if his hands and ears are given months of varied play experience with toys that unite tactile and auditory qualities, he will have found interest and taken pleasure in the spaces immediately around him. He will then be ready to move into a larger space when he becomes aware of the interesting possibilities just beyond his reach.

2 Alley, G. R. Perceptual-motor performances of mentally retarded children after systematic visual-perceptual training. *American Journal of Mental Deficiency*, 1968, *73*, 247-250.

Rationale

The purpose of this study was to determine if educable mentally retarded Ss make significant improvements in sensori-motor, visual perception, and concept formation activities after an extended, systematic training program of visual-perceptual activities. The investigation was based upon the theory that improvement of visual-perceptual performance should be reflected in improved performance on sensori-motor and concept formation tasks.

Subjects

Forty-eight Ss were selected for this investigation. They were educable mentally retarded children, age range seven years, five months to nine years, ten months, enrolled in special classes in an urban public school system.

Method

The forty-eight youngsters were divided into two age-matched, sex-paired groups of twenty-four Ss each. The experimental group was subjected to a systematic visual-perceptual training program covering a two-month period. The control group spent the concurrent time in regular special education classroom activities. The training program consisted of visual-perceptual activities as presented by Frostig and Horne. The activities were graduated in difficulty and included five areas: 1) Eye-Motor Coordination, 2) Figure Ground, 3) Form Constancy, 4) Position in Space and 5) Spatial Relations. The experimental group met for thirty minutes each school day. Each daily training session included the completion of five worksheets which were distributed equally over all five visual-perceptual areas. Assessment instruments included Lincoln-Oseretsky Motor Development Scale, Purdue Perceptual-Motor Survey, Benton Visual Retention Test, Kuhlmann-Finch, Frostig Developmental Test of Visual Perception, and Illinois Test of Psycholinguistic Abilities.

Results

The results obtained from the criterion measures were statistically subjected to analysis of covariance utilizing a treatments by pairs design. Both the experimental and control groups' mean scores on several performance measures reflected improvement when comparing the pre and post test administrations. However no significant differences were evident between the adjusted posttest mean scores of the two groups.

Conclusions

The results of this study would suggest that there are no advantages to be derived by educable mentally retarded children from a systematic visual-perceptual program in regard to subsequent sensori-motor, visual-motor, perception and concept formation performance over general special education classroom activities.

3. Alley, G.R., & Carr, D.L. Effects of systematic sensory-motor training on sensory-motor, visual perception and concept formation performance of mentally retarded children. Perceptual and Motor Skills, 1968, 27, 451-456.

Rationale

This study investigated aspects of Roach and Kephart's (1966) theory of perceptual motor development. They conceptualize a hierarchical, interdependent development of three levels: motor-movement patterns, perceptual organization and concept formation. The purpose of the study was to determine if EMR Ss make significant improvements in sensory-motor visual-perceptual, and concept-formation activities after an extended, systematic training program of sensory-motor activities. Improvement in sensory-motor performance should be reflected in improved performance in visual-perceptual and concept formation tasks.

Sample

Fifty-six EMR children were divided into two equal age-matched, sex-paired groups. The Ss were all enrolled in special classes in an urban Iowa public school system. The E group was composed of 15 boys and 13 girls. (Mean IQ of 67.71, range of 53-77 and mean CA of 8 years, 9 months, range of 7 years, 5 months to 9 years 9 months.) The C group had the same sex composition, mean IQ of 65.11, range of 48-76, and mean CA of 8 years, 9 months, range of 7 years, 5 months to 9 years, 10 months.

Method

Both groups were pre and post tested on the Lincoln-Oseretsky Motor Development Scale, selected areas of the Purdue Perceptual Motor Survey, the Benton Visual Retention Test, the Kuhlmann-Finch, the Frostig Developmental Test of Visual Perception, and the ITPA. The sensory-motor training program was given over a two month period with a single 30 minute training session each school day. The program followed the format developed by Kephart (1960) and included activities in six basic areas: 1) walking board activities, 2) balance board activities, 3) trampoline activities, 4) angels-in-the-snow, 5) stunts and games and 6) rhythm activities. The C group engaged in the usual special education classroom activities during this time. The regular curriculum followed by both groups during this period also included a physical education program.

Results

Both the E and C groups' mean scores on all criterion measures showed improvement from pretest to posttest administrations. Analysis of covariance indicated no advantage for EMR children exposed to the Kephart program over a general special education classroom with respect to sensory-motor, visual-motor, perceptual and concept formation performance.

4. Alley, G.R., & Snider, B. Comparative perceptual motor performance of Negro and white young mental retardates. Developmental Psychology, 1970, 2, 110-114.

Rationale

The authors compared the performances of mentally retarded Negro and white groups on selected psychological instruments which included those suggested for diagnostic use in the area of perceptual motor development and learning disabilities by researchers with primary interest in these areas. Roach and Kephart provided the theoretical model for investigative guidelines.

Subjects

Eighteen Negro subjects and 32 white subjects were included in the two groups. Ten children were excluded from this sample on the basis of the following criteria: (a) the evidence of significant physical factors in the child's prenatal, paranatal, and/or postnatal medical history; (b) the evidence of significant symptomatology, which would affect his motor performance, during a medical examination, that is, convulsive disorders, cerebral palsy, and neurological dysfunction such as defects in alternating motion rates, and/or motor incoordination; and (c) the child's restriction from physical activity by medical order. A child was classified as Negro (N) or white (W) by employment of the same sociological definition of race as used by this school district. The subjects were enrolled in a special school which served all educable mentally retarded children of elementary school age of Davenport, Iowa. The subjects' chronological ages ranged from 7 years, 5 months to 9 years, 10 months.

Method

Subjects were administered the selected perceptual motor diagnostic instruments which included sensory motor, visual perception, and concept-formation tasks. The following instruments were used: (a) sensory motor performance measures - the Lincoln-Oseretsky Motor Development Scale and the Purdue Perceptual-Motor Survey, Balance and Posture area and Body Image and Differentiation area; (b) visual perception measures - the Benton Visual Retention Test, the Kuhlmann-Finch Tests and theMarianne Frostig Developmental Test of Visual Perception (Frostig Test) and (c) concept-formation measure, the Illinois Test of Psycholinguistic Abilities.

Results

Sensory Motor Performance: A higher mean total score was obtained by the Negro group on the Lincoln-Oseretsky scale which yielded a significant *F* ratio. The Negro group obtained a higher mean criterion score on 41 of 53 tasks on this measure. A nonsignificant *F* ratio was obtained when comparing the mean total combined scores of the Balance and Posture area and the Body Image and Differentiation area of the Purdue survey of the two groups. However, the Negro group obtained a higher mean criterion score on 9 of 11 items of the Purdue. Concept-formation Performance: The Negro group obtained a higher mean criterion score on 15 of 19 variables on the ITPA. The white group performed with a higher mean score on 4 variables. However, these discrepancies between the mean scores of the two groups were not significant.

Conclusions
The results of this study would suggest that Negro mentally retarded children, chronological age 7 years, 5 months to 9 years, 10 months, are more proficient on sensory motor tasks than are their white counterparts.

5. Auxter, D. Effects of reinforcement on motor learning and retention by mentally retarded. Perceptual and Motor Skills, 1969, 29, 99-104.

Rationale
The purpose of the present study was to investigate the effects of reinforcement on (a) the learning of gross motor skill by mentally retarded Ss, (b) the relatively long-term retention of that gross motor skill, and (c) patterns of motor learning.

Subjects
Thirty-two educable mentally retarded Ss, aged 10 to 12 had IQs ranging from 50 to 73; they were free from gross motor or sensory defects. Two groups of 16 children each, matched in CA and sex, performed the task. One group was designated as an experimental group and was reinforced with candy after successful or improved performance on the stabilometer; the other group was not given candy reinforcement.

Method
The stabilometer, which has been described as a satisfactory instrument to measure the learning of a gross motor task, was used in this study. The motor task consisted of balancing the platform attached to the stabilmotor. Ss were measured for retention of the motor learning six months subsequent to initial testing.

Results
A t test, which compared the slopes of the learning curves, indicated that the rates of learning by the groups were different, the reinforced group being superior. The Wilcoxon rank-sum test indicated no significant differences on the retention over six months between groups.

Conclusions
The results show that: (a) mentally retarded children are capable of learning motor tasks involving rapid motor adjustments; (b) reinforcement of a gross motor task may facilitate greater learning and it retards the effects of the onset of satiation, which leads to decrements in performance; (c) reinforcement for performance on the stabilometer does not result in significantly greater retentionover a six-month interval.

6 Auxter, D. Learning disabilities among deaf populations. *Exceptional Children*, 1971, *37*, 573-577.

Rationale

This investigation attempted to identify perceptual-motor characteristics which might account for, or attribute to, the differences in academic learning ability in deaf populations of comparable CA and IQ. The purpose of the study was to compare a group of deaf children who had above average intelligence scores and academic functioning well below expectations.

Subjects

Two groups were formed for comparison. The first group was comprised of 15 subjects who were learning academic tasks at expected levels commensurate with their IQ. This group had a mean age of 15.6. The mean IQ was 105. A second group of 15 subjects were educationally retarded in excess of 3 years and were not learning academic tasks at expected rates. This group had a mean age of 15.8. The mean IQ was 109.

Method

Tests were selected to measure development of the balancing mechanism, sensory avenues, and physical andperceptual-motor areas. It was believed that this battery of tests was comprehensive in nature and sampled many components of the perceptual-motor, physical and motor structures.

Results

This study indicated that, as a group, the deaf children with learning disability did not have impairments in balance or the sensory avenues of visual discrimination, kinesthesis, and weight perception. No significant differences between groups appeared on sensory avenues of visual kinesthesis. The remaining portion of the study involved tests which measured factors of a physical and motor nature. The results of these tests showed that significant differences existed between the groups on speed of limb movement, dynamic flexibility and the two-footed standing broad jump. While each of these tests measures a different dimension of physical or motor fitness, they are all relatively gross in nature and require speed of movement for success. Two of the most gross motor tasks used as measures in the study were the step test and the bent-leg situp. There were significant differences in both tasks. When motor planning was involved and where a response had to be acted out with speed, discrepancies in ability appeared between the two groups, in favor of the group with no learning disability. In addition, the difference between groups was more noticeable when the tasks were gross and the neuromuscular behavior was more complex.

Conclusions

Since motor movements involving neuromuscular integration, gross strength, and the ability to endure appeared to be less developed in the learning disability group, this might suggest that considerations be given to programs which, in part, would remediate these particular characteristics. The prospects forthe implementation of such programs are good, for it is common knowledge thatgross strength measures can be enhanced through progressive-resistive training. Programs of sequential activity for the purpose of developing motor speed seem feasible. Furthermore, although specific programs fordeveloping neuromuscular coordination per se are not known, variation in movement experiences tends to build a reservoir of motor experience which enhances general neuromuscular coordination.

Auxter, D. Motor skill development in the profoundly retarded.
7. Training School Bulletin, 1971, 68, 5-9.

Rationale

The purpose of this paper is to describe the procedures to provide greater motor function forthe profoundly mentally retarded who are in a non-ambulatory state. Through the inspection of motor development scales four major objectives emerged which seemed applicable for programming for the profoundly mentally retarded for increased locomotor development. The prerequisites for locomotor development appear to be the following: (1) the possibility of random movement in all planes at any joint; (2) the establishment of antigravity groups of muscles which enable a person to resist and partially establish control over gravitational forces; (3) the development of an awareness of qualitative movement; and (4) the integration and coordinationof joint function forpurposive, specialized movement.

Subjects

The group in the project included twelve profoundly retarded persons between the ages of 12 and 30. The mental age of these persons was reported to be 6 months to 18 months. All subjects were non-ambulatory with minimal movement capabilities. Integrative function for specific movement was not present.

Method

Specific programs were designed to achieve the purpose of the above-mentioned locomotor prerequisites. The first aspect of the program was designed to increase the range of motion of contracted joints by progressive stretching, placing sufficient tension in amounts so as to stretch the muscles at the joint. This particular part of the program seemed to be prerequisite to all other aspects of the total program for it was directly or indirectly related to random movement exploration, anti-gravity control, and the development of qualitative motor control. A second aspect of the program was designed to develop strength of anti-gravity muscles directly related to upright locomotion. The cephalocaudal developmental continuum was used to place the mentally retarded person at an entering point in the program to guide subsequent development. A third dimension of the program was to provide considerable movement so that quantities of proprioceptive stimulation would acquaint the patients with the movement capabilities of their bodies. This was accomplished by providing gross motor activities which engaged the total body in changes of position. A fourth aspect of the program involved an attempt at integrating motor function which would lead eventually to purposive skills development. The scooter board was used to integrate the movement of the various joints of the body. The motivational level of the profoundly mentally retarded as a group was extremely low. Therefore, M & M candies were the primary motivational manipulator to try to bring about repeated and improved performance. Social approval proved to be successful reinforcement for some of the patients. In most cases, it was difficult to engage the patients in new responses. Therefore, it was necessary in many cases to use aversive consequences to elicit a response.

Results
The results of the program show that a staff which had an orientation to work toward specific objectives with the profoundly retarded can improve motor function in this gorup, for gains were made in some aspect of the program in all cases. Furthermore, it was the experimenters' observation that, with the acquisition of motor function there was increased will for the patients to more actively engage in more volitional motor activity.

8. Ball, T.S., & Edgar, C.L. The effectiveness of sensory-motor training in promoting generalized body image development. The Journal of Special Education, 1967, 1, 387-395.

Rationale
While Kephart's theory of perceptual development and correlated training program involve more than one level of perceptual functioning, the present research focuses on his assumptions regarding sensory-motor training. The experimenters' purpose was to determine whether Kephart's training procedures yield anything more than highly specific sensory-motor skills. To answer this question affirmatively it is necessary to demonstrate that sensory-motor training generalizes to non-practiced performances that are relevant to body image.

Subjects
The sample consisted of 30 children enrolled in the kindergarten classes of a public school.

Method
The subjects were tested before and after the training program with a group intelligence test. One of the tests consisted of the first 20 items of Benton's right-left discrimination battery. The subjects were given Benton's finger localization test. The final test was a modified version of Head's "hand, eye, ear test." This test differs from Benton's right-left discrimination battery in that the subject's responses are entirely imitative so thatverbal concepts of left and right are not required. Two research assistants worked with the training group five days a week for three and one-half months. Each of the four daily recess periods lasted from 15 to 20 minutes. The training procedures were specifically designed to develop laterality and body image. The ten tasks receiving the greatest emphasis were as follows: walking board, balance board, chalkboard (directionality and orientation), angels-in-the-snow, skipping, rhythm (especially bongo drums), rope jumping, peas porridge hot, stunts and games (crab-walk, duck-walk, etc.) and trampoline routines on bed springs and mattress. As in any perceptual training program, it was necessary to be constantly aware of the child's developmental progression and to observe appropriate timing for the introduction of new activities or the modification of old ones. The same assistants spent approximately the same

amount of time with the control subjects as with the training subjects.

Results

The analysis of the Head data indicated that a significant decrease in error scores between pre and post tests occurred only in the training group. The results indicated that both groups improved (but approximately equally) on the finger localization test. No differences whatever were found on the right-left discrimination test or the group intelligence test.

Conclusions

The results of the study indicate that when sensory-motor development is accelerated in normal subjects, there is a concomitant gain in generalized body image development.

9. Bem, S.L. Verbal self-control: The establishment of effective self-instruction. Journal of Experimental Psychology, 1967, 74, 485-491.

Rationale

The present experiment is an investigation of the ontogenetic origins of verbal self-control, the ability to generate a self-instruction, and to respond to it appropriately. Earlier research has suggested that young children are not able to regulate their own behavior by means of self-instruction. The present experiment attempts to demonstrate that a system of self-generated cues can be established experimentally in 3-year-old children whose pretest performance indicates an absence of verbal self-control. If effective self-instruction can be established during an experimental period of 3 weeks, the absence of verbal self-control would appear to result not from a developmental deficiency, but from a learning deficit.

Subjects

Six 3-year-old and six 4-year-old nursery school children served as Ss.

Method

The task designed to measure verbal self-control requires the child to press a lever that numberof times corresponding exactly to the number of lights presented on a display; because the child is not permitted to respond until after the lights have been covered, he must make use of self-generated stimuli, i.e., counting responses, if he is to respond correctly. The Ss were assigned to the various training procedures on the basis of their pretest performance. An S assigned to a given training procedure completed its requirements as well as those of all subsequent training procedures, in the order specified. The training sequence included: 1) verbal training, 2) verbal fading, 3) motor training, 4) verbal-motor training, 5) verbal-motor fading.

Results

At the completion of the training, all Ss were able to respond correctly. These data clearly indicate that the training procedure is sufficient for successful test performance, for self-control of response termination. They further demonstrate that the reported absence of mediation is not due to a developmental deficiency, but to a learning deficit. If an S is trained to respond to the self-generated stimuli of his own responses, that is, if his responses are forced to function as discriminative stimuli, that S is able to control his own behavior.

Conclusions

The results of the present experiment indicate that verbal self-control can be produced experimentally in 3-year-old children. The fact that its absence was found to result not from a developmental deficiency, but from a learning deficit indicates that speech can gain new functional significance by means of a learning procedure and, further, that a learning procedure may be necessary for the natural emergence of verbal self-control. While this does not imply that a child of any age can be trained to obey his self-instruction, it does emphasize the importance of learning in the establishment of effective self-instruction, and it therefore has direct bearing on the traditional question of the relative contributions of development and learning toward the natural emergence of verbal self-control.

10. Boyd, J. Comparison of motor behavior in deaf and hearing boys. American Annals of the Deaf, 1967, 112, 598-605.

Rationale

This study was designed to compare deaf and hearing boys on the motoric functions of: static equilibrium, locomotor coordination, psychomotor integration (as indicated by kinesthetic functioning and speed) and to explore the area of laterality in greater detail.

Subjects

There were ninety deaf boys in the experimental group. The hearing control group was matched with regard to age, sex and IQ to the experimental group. There were ten subjects at each age level.

Method

It was decided to use an adaptation of the Oseretsky Scale to evaluate the areas of static equilibrium, locomotor coordination and speed. Four tests, kinesthetic control of force and memory, kinesthetic control of force, speed, aiming and memory, kinesthetic maze memory and kinesthetic memory for geometric designs were adapted from the Van Der Lugt Psychomotor Series for Children.

Results

Static Equilibrium: At every age there were significant differences among groups at the .01 level. The static sense of equilibrium as measured by the general static test of the Oseretsky indicated a significant difference between hearing and deaf groups regardless of etiology. Locomotor Coordination: On the general dynamic test of the Oseretsky, results indicated that there were no significant differences among the hearing and deaf groups at the eight year level, but that there was an increasingly significant difference among the nine and ten-year-old control and experimental groups. On the three tests used to evaluate kinesthetic memory, there were no significant differences between the deaf and the hearing at any age level. The scores of the deaf subjects tended to be better than average. The deaf seemed to be using kinesthetia in a compensatory manner, corroborating the hypothesis that there is a shift in the use of other sensory modalities in the presence of sensory deprivation. In speed of motor functioning as measured by the Oseretsky it was concluded that the deaf were equal to the hearing in the area of speed. In static equilibrium, the control group was superior to the norms at all age levels. Generally the experimental group showed a year of retardation. The control group showed good agreement with the norms in locomotor coordination. The experimental group showed good agreement at the eight-year level, but two years of retardation at the ten-year level.

Conclusions

The present findings do not suggest that the deaf are retarded in the area of speed as measured by the Oseretsky Scale. There are indications that the deaf are making a shift and are using kinesthesis to advantage in the maintenance of hemeostasis.

Bundschuh, E.L., Williams, W.C., Hollingworth, J.D., Gooch, S., & Shirer, C.
11 Teaching the retarded to swim. *Mental Retardation*, 1972, *10*, 3, 14-17.

Rationale

Recreation is an important dimension of programming for mentally retarded children and aquatic experiences are among recreational activities most highly recommended. Success in swimming could also reinforce involvement in other activities. The authors adopt a limited goal of making the water-safee ableto retrieve himself from a distance of 10 feet from the edge of a deck, pool or dock. The authors adapted an established elementary/preschool swimming method for use with EMR and TMR children.

Method

Forty mentally retarded children (14 TMRs and 26 EMRs, CA range 5-19 years) were taught for 20 days using Gabrielsen's Total Push-Kick Method. The method is "based on accelerating the teaching-learning process of a complex motor skill" and utilizes a philosophy of "gentle persuasion" i.e., making the decision for the child. The original Gabrielsen's method was adapted to a retarded child's rate of growth and development. Objectives were defined to provide for development of skills, confidence, and coordination, as well as to provide enjoyable recreational activities. Routine, repetition, relaxation and reinforcement were stressed in lessons teaching 15 specific basic swimming drills. There was a 15 minute playtime before and after each lesson.

Results

90% of the children learned to swim, and 10% progressed from non-swimmer to swimming 75 feet or more. Posttest swim for maximum distance scores ranged from 2 to 120 feet with a mean of 12 feet. All of the EMR children could swim 6 feet or more. Although not all of the TMR children were able to swim more than 6 feet, they had made successful adjustment to the water. Mid-program testing demonstrated an average gain in swimming distance of 26 feet.

Conclusions

The authors state that "the method employed was an excellent approach in teaching TMR and EMR students to swim" and could be profitably employed in physical recreation programs.

12 Carlson, B.R., Gallagher, P., & Synoveck, S. Assessment of the motor ability of visually impaired children. Perceptual and Motor Skills, 1970, 30, 1009-1010.

Rationale

This study was designed to assess the current status of the gross motor ability of residential lower-elementary visually-impaired children.

Subjects

The 18 Ss were the entire mobile population of Grades 1 to 4. Ss had been legally blind since birth.

Method

The standard items of the Brace Test were used without modification. The test items were read and demonstrated for the benefit of those Ss with residual vision.

Results

The idea that Ss with partial vision could out-perform totally blind Ss was tested by dividing Ss into two groups based on the extent of residual vision. The lack of a significant difference between the motor ability of the two groups indicated that perception available to those Ss with residual vision was of no additional assistance on gross motor ability stunts.

Conclusions

In comparing the performances of the boys and girls, it was found that the boys had outperformed the girls on the test of motor ability.

13. Chasey, W.D., Swartz, J.D., & Chasey, C.G. Effect of motor development on body image scores for institutionalized mentally retarded children. American Journal of Mental Deficiency, 1974, 78, 440-445.

Rationale

This study was designed to investigate the effects of a physical development program on body image concepts of TMR children as measured by barrier and penetration variables from the Holtzman Inkblot Technique. Authors suggest that the child's concept of body image derives from thechild's perception of the efficacy of his movement within social settings. Negative perceptions over time result in negative body image incorporated into personality structure. Physical training of TMRs should lead to increased movement efficacy, improved social response and improved body image.

Sample

Forty-four TMRs ranging in CA from 124-233 months, SBIQ 27-56.

Method

Ss were randomly assigned to one of 3 groups: a) Experimental, (b) Hawthorne Control and c) Control Group. Groups were similar in CA, IQ range, and retardation etiology. All children were pre and post tested on the shortened version of Form A of the Holtzman Inkblot Test, 2 days prior to the physical training program and 2 days after the termination of the program. The barrier variable was scored for reference to any protective covering, membrane, shell or skin that might be symbolically related to body image boundaries. The penetration variable was scored for concepts symbolizing S's feeling that his body exterior is of little protective value and can be easily penetrated. For 5 weeks the experimental group participated in 1 hour/day in a physical development program including distance running, game and sport skills, gymnastics and basic movement skills (emphasis on gross motor skills). The Hawthorne Control Ss participated in a "sedentary recreational program" consisting of quiet walks, coloring and reading. Regular control had no specialized program.

Results

Results were presented in terms of number of Ss giving barrier and penetration responses from pretest to posttest. Number of experimental Ss giving at least one penetration response decreased significantly, with control Ss showing no change. Barrier responses showed no significant change for any group.

Conclusions

Results for penetration are in agreement with other data indicating that motor-oriented exercises, which focus attention on the musculature, increase body definiteness. Failure of barrier score to show change is inadequately discussed.

14. Chasey, W.C., & Wyrick, W. Effect of a gross motor developmental program on form perception skills of educable mentally retarded children. *The Research Quarterly*, 1969, *41*, 345-352.

Rationale

The purpose of this study was to determine the effects of a concentrated physical developmental program on the visual-perceptual-motor skills of institutionalized EMR children. It was hypothesized that: a) EMR children given a concentrated developmental program would show a significant improvement in perceptual-motor skills; b) that the experimental EMRs would be significantly superior on the final PFT to the control EMR children who did not receive the physical developmental program.

Subjects

Subjects for this study were 20 EMR children. Twelve EMR children enrolled at the same school were utilized as a control to eliminate the contamination of the Hawthorne effect. The subjects ranged in age from 73 to 146 months, and in IQ from 50 to 85.

Method

Seven perceptual forms of theWinter Haven Perception Test were selected as pre and post measures of form perception proficiency. The seven components of the Winter Haven form perception test are the following: circle, cross, square, triangle, divided rectangle, horizontal diamond, and vertical diamond. A university physical education major student clinician was assigned to three or four subjects for the entire 15-week program. The program was conducted five days a week for one hour per day. It provided a wide variety of gymnasium and playground activities, conditioning and coordination exercises, gymnastics, games and modified sports for the subjects. The control subjects received no formal physical education instruction but did participate in free play during recreational periods.

Results

No significant differences in performance on the PFT items or total score existed between the mentally retarded group who received a physical developmental program and the mentally retarded gorup that did not.

Conclusions

A developmental program of gross physical activity appears to have no effect on a mentally retarded child's ability to perceive and copy geometric forms. Although Kephart has held the view that movement is necessary if environmental space relationships are to be developed, and Ayres has listed tactual perception as well as proprioception to be necessary for perceptual-motor development, practice in gross motor activities apparently is not specific enough training to cause groups having the practice to be superior in perception to those not having it. Researchers in physical education are methodically producing overwhelming evidence that motor performance ability is task-specific, not only between individuals but within individuals. It is no surprise, then, that practice in gross motor activities contributes little to the motor component of reproducing a geometric stimulus. The results of this study lend support to the specificity of motor performance theory, in that these results indicate that even in mentally retarded children copying is a specific motor ability. Although the Winter Haven Perceptual Forms Test predicts academic success, and programs that have improved Winter Haven scores have also predicted that children are more ready for school, gross motor developmental programs may not be considered among those methods that improve scores. Therefore, gross motor activities probably do not have a substantial influence on academic success in the early grades.

15. Chasey, W.C., & Wyrick, W. Effects of a physical developmental program on psychomotor ability of retarded children. American Journal of Mental Deficiency, 1971, 75, 566-570.

Rationale

Es criticize the failure to distinguish between motor proficiency and physical fitness in the work done to determine the effects of physical training on the mentally retarded child. They view motor proficiency as having the ability to perform gross motor coordination skills (agility, hand speed, wrist flexibility and finger dexterity) and physical fitness encompassing factors of strength, endurance, and generally good physical health. This research focused specifically on the effects of a physical developmental program on the motor proficiency of EMR children. The hypotheses tested were the EMR children given a concentrated physical developmental program would show improvement in fine and gross motor skills and also score significantly better on the Oseretsky Tests of Motor Proficiency than an EMR group that did not participate.

Sample

Ss were drawn from among EMR children in the Austin (Texas) State School Annex. Twenty-seven in the E group and 20 in the C group completed the posttest (IQ range 50 to 85 and CA range of 73 to 146 months).

Method

Both groups were pretested and posttested with the Oseretsky Motor Development Scale. The scale consists of six factors to evaluate components of gross and fine motor proficiency. The E group participated in a 15-week program of physical developmental activities. These Ss met 1 hour/day for 5 days/week. A group of 3 to 4 was supervised by a physical education student clinician and participated in concentrated activities including gymnastic activities, tumbling, conditioning exercises, and playground activities. The C group did not participate in this program, only engaging in the same free play activities as did the E group.

Results

Analyses of variance were computed for pre and post test group means on the six Oseretsky factors and the total Oseretsky score. The E group showed significant gains only in Dynamic Coordination of Hands, and General Dynamic Coordination. Control group scored higher on posttest in Motor Speed and Simultaneous Voluntary Movement. The E and C groups did not show any significant differences in total Oseretsky scores. The Es note that the E group did surpass the C group on the majority of the Oseretsky factors on the posttest.

Conclusions

Es conclude that "a physical education program consisting primarily of practice in gross motor activities and rhythms made dramatic improvement in the gross psychomotor capacities of EMR subjects." Inadequate analysis and reporting of data suggests caution in interpretation of this conclusion.

16. Corder, W.O. Effects of physical education on the intellectual, physical and social development of educable mentally retarded boys. *Exceptional Children*, 1966, *32*, 357-364.

Rationale

The purpose of this study was to investigate the effects of a systematic and progressive program of physical education on the intellectual and physical development and social status of educable mentally retarded boys. The predictions were that: the training group would make significantly higher Full Scale gain scores on the WISC and on the Youth Fitness Test than would the officials group; and the training group and the officials group both would make significantly higher gain scores on the Cowell Personal Distance Scale than the control group.

Subjects

Ss were 24 EMR boys divided into three groups of eight matched on CA and IQ. Ss were between the ages of 12-0 and 16-7 years with WISC IQ scores between 50 and 80.

Method

The eight boys that served as the training group received a progressive and systematic twenty-day program of physical education. Each day the training group was given a greater challenge than the previous day. Lessons included neck exercises, fingerand arm exercises, knee bends, jumping, sit-ups and push-ups, running, broad jump and general body exercises for approximately two hours/day. The eight boys in the officials group met each day with the training group. It was their job to monitor the progress of the training group and was included as a Hawthorne control.

Results

The training group made singificant Full Scale mean IQ gain scores over the control group. There were no differences in IQ between the training group and the officials group. When the Performance and Verbal scales were analyzed separately, the results indicated a significant difference a month the three groups only on the Verbal scale. The training group made significant gains over the officials and the control groups on all seven physical fitness tests. All boys in the training group showed improvement in every subtest of the Youth Fitness Test. There were no differences among the three groups on mean gain scores on the Cowell Personal Distance Scale.

Conclusions

Corder suggests that his findings support Oliver (1958) in that the effect of such training is apparent on tests of verbal and scholastic attainment of EMRs. Author suggests that the relationship between physical fitness, social status and IQ is highly complex and in need of further study.

17. Cornish, R.D. Effects of neurological training on psychomotor abilities of kindergarten children. *The Journal of Experimental Education*, 1970, *39*, 15-19.

Rationale

The specific hypothesis tested in this study is that children with perceptuomotor difficulties who are given cross-patterning exercises will show a greater improvement in perceptuomotor coordination than children with the same difficulties who are not given the exercises.

Subjects

The Ss were fifty kindergarten children who had been found to have perceptuomotor and/or psychomotor deficits, as defined by scores on subtests of the Purdue Perceptual Motor Survey (walking board, occular pursuit, identification of body parts, imitation of movement), the Draw-A-Man and Ten Dot subtests of the Anton Brenner Developmental Gestalt Test of School Readiness, and lack of visual fusion as measured by the Keystone Visual Survey.

Method

The Ss were assigned to the experimental (E) or control (C) group, depending upon the school they attended. Schools were randomly assigned to treatment. The appartus used in this experiment was the Exer-Cor, a mechanical device that ensures proper synchronization of cross-patterning movements. It is a device 48 inches long and 14 inches wide. It has hand and knee pads that ride on rollers and are moved by muscular effort. These pads are interconnected by a system of cables and pulleys that literally force cross-patterning. Ss in the E group then trained on the Exer-Cor 3 minutes per day for a period of 3 months. Ss in the C group were not given any compensatory attention to control for the Hawthorne Effect.

Results/Conclusions
That neurological training exercises, specifically cross-patterning exercises, will improve perceptuomotor skills as herein defined has not been shown by this study. Of the six measures of perceptuomotor skills, there were only three instances where the experimental group improved more than the control, and one case where the control group scored significantly higher than the experimental. This would seem to provide evidence against Delacato's theory of neurological training.

18. Doman, R.J., Spitz, E.B., Zucman, E., Delacato, C.H., & Doman, G. Children with severe brain injuries. Journal of the American Medical Association, 1960, 174, 3, 257-262.

Rationale
During 1956 and 1957 the investigators developed a new approach, the goal of which was to establish in brain-injured children the developmental stages observed in normal children. The program which aimed at both normal and brain damaged levels consisted of: a) permitting the child normal developmental opportunities in areas which the responsible brain level was undamaged; b) externally imposing the bodily patterns of activity which were the responsibility of damaged brain levels; and c) utilizing additional factors to enhance neurological organization.

Subjects
This study of 76 children includes every child seen in the Children's Clinic during the study period who met the following criteria; 1. The existence of brain injury. (For the purpose of this study, brain-injured children are defined as those children whose lesion lies in the brain. The definition includes both traumatic and non-traumatic lesions but excludes children who are genetically defective.) 2. A minimum of six months' treatment. 3. No child was eliminated because of the severity of hisinvolvement. The group of 76 was composed of children who had spasms, athetosis, ataxia, rigidities, tremors, and mixed symptoms; 24 of these children had clinical seizures. The brain pathology was classified as to type, location and degree. The ages ranged from 12 months to 9 years, with a median age of 26 months and a mean age of 30 months. The children were separated into three age groups of developmental significance: 0-18 months, 16 children; 18-36 months, 41 children; and over 36 months, 19 children.

Method
The level of movement was defined according to a modification of the developmental patterns of Gesell and co-workers and Fay, and these were numerically designated for reference purposes. The stages described are a) moving arms and legs without forward movements, b) crawling, c) creeping, and d) walking.

The authors felt that each stage described was dependent on the successful completion of the previous stage. The duration of treatment ranged from 6 to 20 months, with a mean of 11 months. After thorough neurological studies, the children were evaluated to determine their disabilities in functional terms. An outpatient program of neurological organization was then prescribed and taught to the parents. The parents were required to carry out the program exactly as prescribed. Treatment Type I: All nonwalking children (56) were required to spend all day on the floor in the prone position and were encouraged to crawl (prone method) or creep (hand-knee method) when that level of accomplishment was possible. Treatment Type II: In each case, at that level of accomplishment at which pathology precluded the child's advancement to the next developmental stage, a specific pattern of activity was prescribed which passively imposed on the central nervous system the functional activity which was normally the responsibility of that damaged brain level. Each of these patterns had its counterpart in the normal developmental growth of a healthy child so well described by Gesell. The children were patterned for five minutes, four times daily, seven days a week without exception. The patterns were administered by three adults. Treatment for Neurological Organization: To enhance neurological organization, the children were evaluated in the light of the functions described below, and a treatment program was devised. The program included the following stages: 1. When tests showed sensory losses or when results of tests were indefinite due to communication problems, the children were placed on a program of sensory stimulation which included application of heat and cold, brushing, pinching and establishment of body image appreciation by letting the child experience the relationship between his hand and his face, his hand and his mother's face, and similar relationships. 2. As each child reached the point where laterality influenced neurological organization, a program to establish dominance was instituted. 3. A breathing program to improve vital capacity was prescribed.

Results

Global Results - The mean improvement of mobility was 4.2 levels. Of the 20 children unable to move and the 17 unable to walk, none remained at these stages. Twelve children were ready to walk at the end of the study. Eight were creeping cross-pattern and four were holding onto objects. Eleven children learned to walk completely independently. All but two of these had begun treatment at, or before, two years of age, and all achieved completely independent walking in less than 12 months of treatment. The functional level of this group at the beginning of the study was virtually the same at the level of the other 65 children. The entire group mean level at the outset was 4.4, compared with a mean of 4.1 for this group of 11 who learned to walk independently. There was no significant difference of mean improvement among the three different age groups.

Conclusions

The authors found significant improvement when they compared the results of the classic procedures they had previously followed with the results of the procedures described above. It is their opinion that the significance of the difference tends to corroborate the validity of the hypothesis set up as the theoretical basis of the program. These procedures are based on the premise that certain brain levels, i.e., pons, midbrain, and cortex, have separate, consecutive responsibilities in terms of mobility. The goal of these procedures (neurological organization) is to create a climate in which a brain-injured child may develop and utilize those brain levels which are uninjured as they are developed in the normal child concurrent with myelinization during the first 18 months of life. The authors believe that the program must include: a) the opportunity for the brain-injured child to spend prolonged periods on the floor in the prone or quadruped position, so that he may crawl or creep in order to utilize uninjured brain areas in physiological development. Given this opportunity, the brain-injured child may advance several developmental levels unaided; b) the utilization of patterns of activity administered passively to a child which reproduce the mobility functions for which injured brain levels are responsible; c) a program of sensory stimulation to make thechild body-conscious in terms of position sense and proprioception. They believe that sensory reception is a prerequisite to motor expression; d) a program of establishing cortical hemisphericdominance through the development ofunilateral handedness, footedness, and "eyedness". This was instituted when a lack of neurological organization at this level so indicated; and e) the institution of a breathing program to achieve the maximal vital capacity, since, in their experience, they had observed the restricted vital capacity and the recurrence of respiratory difficulties in many brain-injured children.

19 Edgar, C.L., Ball, T.S., McIntyre, R.B., & Shotwell, A.M. Effects of sensory-motor training on adaptive behavior. American Journal of Mental Deficiency, 1969, 73, 713-720.

Rationale
The problem of theoretical interest is whether the improved sensory-motor integration presumed to follow from sensory motor training does lead to changes in cognitive (as well as perceptual) development, and thus to gains in adaptive behavior. Children whose developmental status lies in the range of the earliest, or sensory-motor period, should show concomitant changes in adaptive behavior as a result of intensive sensory-motor training. Severely and moderately retarded youngsters of three to eight years have MAs in the approximate range of 12 to 24 months. Deficiencies in both motor development and adaptive behavior make such organically-impaired young retardates natural candidates for sensory-motor training. Most show lack of postural flexibility, poor balance, andinadequate fine and gross motor control. Perceptual organization is typically poor. Any improvement shown by such children should be markedly noticeable. The Gesell Developmental Schedules, which cover a wide sample of behavior, should reflect changes that might occur in such subjects during an eight-month period. It was hypothesized that changes in sensory-motor integration assumed to result from intensive sensory-motor training would be reflected in gains in adaptive behavior.

Subjects
Eleven organically impaired, mentally retarded children ranging in CA from three to eight years and in MA from approximately 12 to 24 months, served as the experimental subjects. They were equated for CA, IQ, general physical development and ability to use sensory-motor training equipment with 11 children who served as controls. The 11 experimental subjects' mean Kuhlmann-Binet IQ was 34.27; their mean CA was 5.6 years. Their mean DA was 1.5 years, and their mean DQ was 26.51. The 11 control subjects' mean Kuhlmann-Binet IQ was 30.81; their mean CA was 5.7 years. Their mean DA was 1.3 years and

their mean DQ was 22.40. Both experimental and control subjects were severely and moderately retarded.

Method

Each child in the experimental group received intensive training in sensory-motor activities adapted from Kephart, 15 to 20 minutes a day, three days a week. It was hoped that the subjects of this study would respond in a measurable way to training in six to eight months. The training procedures were specifically designed to develop laterality and body image. The tasks receiving the greatest emphasis were as follows: walking board, trampoline routines on bed springs and mattress, angels-in-the-snow, rhythm (alternating the arms in hitting a tamborine or bongo drums), balance board, chalk board, (directionality and orientation), and stunts and games (crab-walk, duck-walk, etc.). The control group was seen four times each week by the same persons who trained the experimental group. Fifteen to 20 minutes a day were spent with each child individually in such activities as are traditionally used on training wards when small groups are taken for individual attention. In this manner, the control group operated in a structured situation comparable to that of the experimental group. Following a period of eight months, subjects of both groups were re-evaluated on the Gesell Developmental Schedules.

Results

The experimental group showed greater gains than the control group on the Motor, Language, and Personal-Social Schedules, and in the total score. On the Adaptive Behavior Schedule, the difference between the groups fell slightly below the level of significance. The results of a series of *t* tests revealed that the gains shown by the experimental group were significant on all four sub-scales, whereas those shown by the control group were not significant on the Language and Personal-Social Schedules. The mean DA gain for the children in the experimental group over the eight-month training period was 6.0 months. The mean gain in DA for the children in the control group over the same period was only 2.2 months.

Conclusions

Significant differences between the gains of the two groups are discussed in relation to Kephart's theory of perceptual-motor development and Piaget's theory of cognitive development.

20 Funk, D.C. Effects of physical education on fitness and motor development of trainable mentally retarded children. *The Research Quarterly*, 1971, *42*, 30-34.

Rationale

Research in physical education has primarily been concerned with the physical education of normal and above average students and athletes. Recent studies of the mentally retarded child have focused narrowly on themotor proficiency status of the MR child. Funk feels that research designed within the perspective of the physical educator is required. Specifically, he proposes to investigate the effects of a physical education program on the physical fitness and motor development of TMR children.

Subjects

Subjects were 36 TMR children, both boys and girls between the ages of 8 and 18 in 4 classrooms.

Method

One-half of the children in each class were randomly assigned to the E group (N=18). All children were pretested and posttested on a combination of items selected from thePhysical Fitness for the Mentally Retarded and the Special Fitness Test for the Mentally Retarded. The motor development pretest was the Kershner-Dusewicz-Kershner Revision of the Vineland Adaptation of the Oseretsky Test of Motor Proficiency. Children in the experimental group were given a 30 minute planned physical education program for 58 consecutive teaching days following an eclectic program including balancing activities, running, jumping, crawling, throwing, catching, calisthenics, agility games, relays and other similar activities. The C group had no organized play or activities. They remained in the classroom forthe 30 minute period and participated in table games or other activities (never the same ones as the E group).

Results

The E group gained significantly on two of the five items in the fitness test: sit-ups and the shuttle run. No improvement was noted on the motor development tests.

Conclusions

Results showed that after 58 days in a planned physical education program, TMR children can improve significantly on certain aspects of physical fitness. The overall findings are generally discouraging with respect to the effects of physical education programming on the motor educability of TMRs within a school setting.

21. Geddes, D.M. Effects of mobility patterning techniques upon selected motor skills of primary school educable mentally retarded children. The Research Quarterly, 1967, 39, 953-957.

Rationale

This investigation was initiated to determine the advisability of adding mobility patterning techniques from the theory of neurological organization to programs of special physical education. The study was designed to determine the influence of the mobility patterning techniques, as compared to special physical education activities, upon selected motor skills of primary school educable mentally retarded children.

Subjects

Two primary EMR classes with similar IQ ranges and chronological age ranges from nine years, two months to ten years, seven months were treated and tested as intact units, although only seven subjects per group were included in the statistical analysis, after some subjects were eliminated because of gross physical handicaps or changes in class enrollment.

Method

The experimental group was taught the appropriate mobility patterns in crawling (abdomen touching the floor), creeping (abdomen off the floor with the child on his hands and knees), and walking. These are one aspect of the methods used in the theory of neurological organization. Both groups received daily 30-minute classes, Monday through Friday, from September 1966 to December 1966. After five minutes of exercises at the beginning of every period, each student in the experimental group was patterned in crawling, creeping, or walking activities appropriate for the level of development. The investigator patterned the students by moving the head, arms and legs as indicated. According to Doman thelimbs and head of the children patterned should be moved by three adults. In the program used in this study it was necessary for the investigator to administer the activities to each student on a one-to-one ratio while the other children practiced the patterns on a self-directed basis. After five minutes of traditional exercises, the control group received instruction and practice in special physical education activities of tumbling, ball handling, self-testing, trampolining, rope climbing, and simple relays. The following motor skills were tested: a) leg power (hurdle jump); b) leg power (standing broad jump); c) dynamic balance (the rail walking test); d) agility (agility run); and e) fine manual motor coordination (the matchstick test).

Results
In terms of leg power, the special physical education program contributed more than the mobility patterning techniques. Motor skill tests which measured dynamic balance, fine manual motor coordination and agility indicated that there was no difference in the effectiveness of either program. Thus, neither the mobility patterning techniques nor the special physical education activities provided more improvement than the other in terms of dynamic balance, agility or fine manual coordination.

22. Goodenough, F.L., & Brian, C.R. Certain factors underlying the acquisition of motor skill by pre-school children. Journal of Experimental Psychology, 1929, 12, 127-155.

Rationale
The study was undertaken with the hope of adding to our information regarding certain fundamental aspects of the learning process, through an analysis of some of the specific factors apparently involved in the acquisition of a novel motor skill by young children.

Subjects
The data of this experiment were obtained from 20 four-year-old children enrolled in the nursery school at the University of Minnesota, Institute of Child Welfare.

Method
The apparatus consisted of a ring-toss game with a cylindrical post 3/4 inch in diameter, 6 inches high, mounted on a heavy oak platform. Each child was allowed twenty trials a day for fifty days. The twenty children were divided into three groups. Group A included ten children (four boys and six girls) who were given no instruction whatever as to the manner of throwing. Praise and encouragement were given freely- but no criticisms or suggestions. Group B consisted of six children, two boys and four girls. The procedure for this group was as follows. On the first day the children

were taken to the room singly as was done with those in Group A. The experimenter then said, "This is a game where we try to throw rings over a post. Watch me and I'll show you how." After throwing one or two rings the experimenter continued, "You see how to do it, don't you? You must stand with both feet inside the base - like this - and hold the rings here where they are fastened together, and then try to throw them so they will go over the post. Now you try it." As the rings were thrown the experimenter pointed out the nature of the errors the child was making and urged him to correct them. Apart from the method of holding the rings and general criticism with regard to distance, direction, etc., designed to prevent the setting up of constant errors, no further instructions were given. Group C consisted of four children, two boys and two girls. The procedure used for this group was similar to that used for Group B except that the instruction was more rigid. All the children were required to adhere to a constant method of holding and throwing the rings, and were not allowed to experiment with other methods.

Results

If the number of successes made by each individual child on the last 25 days is compared with that earned on the first 25 days, it is found that for Group A the percentages of improvement range from a loss of 34 percent to a gain of 287 percent with a median improvement for the group of 36 percent. For Group B the range is from a loss of 61 percent to a gain of 147 percent with a median improvement of 66 percent. For Group C the range is from a gain of 53 percent to one of 175 percent with a median of 92 percent.

Conclusions

The data suggest that a) at least in the case of young children whose powers of self-criticism are butlittle developed, uncontrolled practice in a performance of this sort is a relatively uncertain means of acquiring skill, b) verbal suggestion and criticism alone are of small effectiveness in bringing about improvement, and c) continued practice according to a constant method, provided the method be reasonably well suited to its purpose, is more likely to result in improvement in a motor function within a limited period of time than random experimentation with various methods.

23. Goodman, L. The efficacy of visual-motor training for orthopedically handicapped children. *Rehabilitation Literature*, 1973, *34*, 299-304.

Rationale

In this study, the technics of Kephart and Getman were extended to the orthopedically handicapped child. Specifically, this study was designed to determine if the visual, motor, and integrated visual-motor skills of children with this type of handicap could be improved through participation in a systematic visual-motor training program.

Subjects

The subjects for this study were 44 preschool youngsters selected from classes for handicapped children. The subjects, 24 girls and 20 boys, ranged in age from 36 to 81 months. The children fell into two general etiological categories - those with muscular or neuromuscular disorders and those with skeletal deformities.

Method

The pretest battery included the Preschool Attainment Record, the Position in Space subtest from the Marianne Frostig Development Test of Visual Perception, the Ayres Space Test, the Crossing the Midline and Imitation of Postures subtest from the Southern California Perceptual-Motor Tests, and an experimental Motor Development Checklist specially designed for this study. The subjects were randomly assigned to either an experimental or control group. In posttesting, all pretests, with the exception of the Preschool Attainment Record, were administered, plus the following three tests from the Merrill-Palmer Scale of Mental Tests. The Wallin Peg Boards, the Seguin Form Board Test, and the Manikin Puzzle Test. The basic structure and content of the training format were derived from the work of Kephart and Getman and Kane. Both programs focus on the development of motoric and visual abilities in Young children and embody a developmental sequence of visual-motor skills. Specific performance areas are designated and, within each performance area, a hierarchy of skills and detailed suggestions for training are presented. Many of the physically handicapped children for whom this study was designed did not possess the motor integrity necessary to master or even attempt all of the activities prescribed in the original Kephart and Getman-Kane training programs. Therefore, when necessary, modifications in training procedures were made in order to match the training activities to the abilities of the children. The goal was 60 days of training, 20 to 30 minutes per day. A minimum of 40 training sessions, i.e., 16 hours was required of all experimental subjects. During training, the control children remained in their classrooms and continued their daily program, which consisted of traditional nursery school activities, e.g., story time, free play, and arts and crafts.

Results

The performance of the experimental group exceeded that of the control group on three of the criterion variables, but none of the differences was significant. On the remaining seven measures the control group excelled, and in one instance the mean difference was significant statistically.

Conclusions

The results of this study indicate that supplemental visual-motor training had little effect on the motor, visual, and integrated visual-motor skills of physically handicapped children. Apparently, participation in the experimental visual-motor program was no more beneficial than participation in the regular preschool program. A basic assumption that underlies the Kephart and Getman-Kane training programs is that visual-motor abilities are trainable and further that their technics are appropriate for this purpose. The results of this study failed to demonstrate the effectiveness of Kephart and Getman-Kane visual-motor training technics for orthopedically handicapped children.

24. Groden, G. Mental ability, reaction time, perceptual motor and motor abilities in handicapped children. Perceptual and Motor Skills, 1969, 28, 27-30.

Rationale

The study investigated the factors underlying the negative relationship between reaction time and MA in retarded children. Of primary interest was the assessment of the effect of controlling simple and complex motor tasks on that relationship. If the relationship is eliminated when complex motor functioning is partialed out, this would provide evidence for the mediation of complex cognitive-perceptual variables in the RT-MA relationship.

Subjects

Ss were 54 patients of the Rhode Island Hospital Child Development Center, a multidisciplinary clinic for mentally retarded children. Chronological age ranged from 5 to 13 years, while mental age ranged from 3 to 13. Tests were utilized to measure reaction time, relatively simple motor abilities and a complex perceptual-motor ability. The two tests for simple motor abilities were motor strength, measured by means of a Lafayette dynamometer, and finger oscillation. Complex, perceptual-motor coordination was measured by a device referred to as key press.

Results

Reaction time is significantly and highly related to mental age, as are scores on the motor and the motor coordination tasks, motor strength, finger oscillation, and key press. The above relationships remain when chronological age is held constant except as regards motor strength and mental age. Holding motor strength and finger oscillation constant, in addition to chronological age, does not eliminate the significant relationship between reaction time and mental age. However, thisrelationship does disappear when the complex motor coordination task, key press is held constant as well as chronological age. The results are in accord with expectations in that the relationship between simple reaction time and mental ability was not reduced to insignificance by controlling for finger oscillation and motor strength in addition to chronological age, but that such was the case when key press was held constant.

Conclusions

Apparently it is not simply motor ability which may be fundamental to the relationship between intelligence and reaction time, since removal of effects of motor strength, finger oscillation, and motor abilities did not cause this relationship to disappear. In other words, motor ability per se, seems to be irrelevant. Both reaction time and the complex, perceptual motor task, key press, require something over and above what is required by such simple motor tasks as motor strength and finger oscillation. Whether this requirement involves primarily increased vigilance, the visual-motor guidance system, or other factors needs further investigation.

25. Hall, S.L., & Deacon, D.F. Effect noted from the use of the Frostig Training Program with trainable retardates. *Training School Bulletin*, 1970, *67*, 20-24.

Rationale

The primary purpose of the present study was to measure gains made in the area of visual perception by three matched groups of trainable mentally retarded pupils through the use of the Frostig training program.

Subjects

Subjects were 60 institutionalized mentally retarded pupils. These 60 subjects were divided into three chronological age groups of 20 subjects each.

These three groups were further divided into experimental and control subgroups. Each experimental and control subgroup contained ten subjects. (CA 8-12, 10-15, 13-19; IQ 30-54). The control and the experimental groups for each of the age groups were matched groups according to chronological age and Binet IQ.

Method
All subjects were individually administered the Frostig Developmental Test of Visual Perception, the Stanford-Binet Intelligence Scale, the Draw-A-Man Test and the reading and arithmetic subtests of theWide Range Achievement Test. From November to April the Frostig Program for the Development of Visual Perception was employed for 90 minutes per school day with the experimental groups. This training program included 60 minutes of work sheet activity and 30 minutes of physical exercises.

Results
Both E and C groups made significant advances in various subtests at various age levels. All non-Frostig tests showed little change for any group.

Conclusions
In general, the results indicate that the Frostig training program was an effective method to use with trainable mentally retarded pupils in attaining visual perceptual skills in specific areas. Personal observations made by teachers and examiners indicated that the physical training program did result in definite improvement in muscular coordination of the subjects. Gains made by experimental subjects in visual perceptual skills could possibly be reflective of the increased motor ability.

26. Hammill, D.D., Colarusso, R.P., & Wiederholt, J.L. Diagnostic value of the Frostig test: A factor analytic approach. Journal of Special Education, 1970, 4, 279-282.

Rationale
Frostig and her colleagues devised the Developmental Test of Visual Perception (CTVP) which is offered as a diagnostic tool for identifying children who need training in specific areas of visual perception. The DTVP is composed of five subtests, each of which is supposed to tap a specific type of perceptual process. These include eye-hand coordination, figure ground, form constancy, position in space, and spatial relationships. An intervention program was developed to train specific visual perceptual abilities identified by the subtests of the DTVP as being undeveloped or deficient. The Frostig training approach presumes that the subtests do, infact, measure distinct areas of visual perception. The purpose of the present study was to determine whether the DTVP subtests are indeed independent enough to justify such a differential training approach. Regardless of the particular measures included in previous factor analyses and of the types of subject samples, all studies have failed to identify five separate perceptual factors. The present study differs from the others in that: 1) the Ss are economically disadvantaged, predominately black children who reside in the city; and 2) one of the analyses is based on Ss defined as perceptually handicapped.

Method

A test battery was administered to 86 kindergarten and 80 first grade pupils. The table of random numbers was employed to select the 166 Ss from 520 pupils in 18 classes in three center-city schools. Using scores from the Slosson Intelligence Test, the mean MA for first grade Ss was 76.8 months, the mean MA for the kindergarten Ss was 67.4 months. The measures used in this study were the DTVP and the Slosson Intelligence Test. Three factor analyses were performed.

Results

Of the three analyses, two yielded only one factor. This single factor, Visual Perception, accounted for 53 percent of the variance in the first instance and 49 percent in the second. The total sample analysis which combined the DTVP subtests with MA and CA resulted in two factors. With the exception of Eye-Motor Coordination, which loaded with CA and MA to comprise a general maturity factor, the DTVP subtests loaded on a single factor called Visual Perception. These results agree substantially with those of other researchers who have concluded that the DTVP measures one general visual perception factor, rather than the five postulated by Frostig. While profile anlaysis with the DTVP is tempting, it should be quite apparent by now to school psychologists, special educators, and teachers that the evidence is overwhelmingly against such a clinical procedure. The DTVP subtests do not lend themselves to independent interpretation and cannot be used as the basis for formulating individual remedial programs for children with specific difficulties in visual perception. Not only do all the subtests measure a single ability, but also there is considerable doubt as to whether the subtests are sufficiently reliable, individually, to be used in assessment.

27. Harrison, W., Lecrone, H., Temerlin, M.D., & Trousdale, W.W. The effect of music and exercise upon the self-help skills of non-verbal retardates. *American Journal of Mental Deficiency*, 1966, *71*, 279-282.

Rationale

The problem of communication with non-verbal, profoundly, and severely retarded children has served as a barrier to both research and training for many years. The absence of the ability to think abstractly precludes the possibility of direct verbal transmission of concepts through a conventional language system. Simple non-verbal methods of communication should be explored. Thus, music may act as an agent through which the focusing of attention could be increased and the controlled manipulation of music, with respect to some performance measure, may produce an increase in perceptual accuracy and performance. Primarily as a result of a shortage of attendants, a lack of knowledge, and standardized teaching techniques, many profoundly and severely retarded children do not perform basic self-help tasks at their potential capacity. This study attempts to measure the effect of music and exercise upon the self-help skills of such children. The specific task used for measuring changes in self-help ability was unbuttoning a row of buttons. In order to assess any improvement in the general areas of sociability, cooperation, etc., a task of following ten instructions of varying degrees of complexity was incorporated into the pretest and posttest.

Subjects

Ss were 40 profoundly and severely retarded males. The median IQ was 25; the range was 15-35. CAs ranged from 7 to 15 with a median of 11 years. Ss were divided into four groups equated for IQ, social skills as measured by the Vineland, and the absence of grossneuromuscular defects. All Ss were ambulatory, nonverbal, and free from visual and auditory defects.

Method

Ss were divided into four groups of 10 Ss each. Group A was taught the exercises by an attendant with both music and verbal instructions. Group B was taught by verbal instructions but without music. Group C listened to the same tape as group A, but the instructor made no attempt to encourage or discourage any response to the tape, and the Ss did not actually perform the exercises. As a control, group D was brought to the experimental room each day and allowed to play with the attendants, but neither music nor exercise was presented. Three attendants, with a nurse in charge, conducted all sessions for 20 minutes a day, five days a week for four weeks: a total of 6 hours and 40 minutes experimental treatment per group.

Results

On both tasks group A demonstrated a positive increase in performance over group D. More importantly, group A demonstrated a positive increase in performance over both group B and group C.

Conclusions

The results indicate that a combination of music and exercise can have a significant positive effect upon the psychomotor ability of profoundly and severely retarded children. Since unbuttoning buttons of different sizes is clearly a behavior related to the capacity to help one's self, it follows that a combination of music and exercise may be a useful supplement when training profoundly and severely retarded children in such self-help activities. In a similar vein, changes in patterns of response to verbal commands are also influenced positively by music and exercise in combination; the changes being in the same direction as those observed on the unbuttoning task.

28 Hill, S.D., McCullum, A.H., & Sceau, A.G. Relation of training in motor activity to development of right-left directionality in mentally retarded children: Exploratory study. *Perceptual and Motor Skills*, 1967, *24*, 363-366.

Rationale

The purpose of this study was to investigate the effects of a systematic program of exercises on the development of retarded children's awareness of right-left directionality.

Subjects

Ss were the entire class of 14 children from a special class for mentally retarded children. The range of ages was from 8 to 15 years in each group, with a median of 12-3 years in one group and 12-5 years in the other group. All of the children in each group were above the age level at which awareness of laterality of own body parts is stabilized for normal children.

Method

The children were randomly divided into an experimental group and a control group. All Ss were given a test of right-left awareness. Both groups of children then participated in a program of activities for 20 minutes of each school day from January through April. At the end of this period, the test for right-left awareness was again administered to each group. The program of activities was designed to develop an awareness of directionality (right-left, up-down). Some of the activities were adapted from the Frostig Program for the Development of Visual Perception. Activities requiring oral and motor responses to visual stimuli were included as well as physical exercises and games. Group E was given verbal labels for directionality (right-left, up-down) during these activities, while Group C was given identical activities without verbal directional labels. Group E was given a verbal directional label along with motor activities requiring them to use a specific body part. Group C was given the same activities requiring the use of a specified body part without the body label.

Results

There was no significant difference between groups at either the original testing or the test after training. The numberof errors was significantly less after training.

Conclusions

These findings suggest that the lag in development of a concept of right-left awareness found with these retarded children is not due to a deficit in verbalization, per se. The normal child has progressed to conceptual reasoning of spatial relations by the age of 7. If retardation represents a slowing down of the progress through intellectual states of development, the retarded child might require a greater amount of experience than normal children in orienting his attention to the relationship between his own position and other objects in space in order to develop a schema of spatial relationships in his sensori-motor system. That motor activities without verbal labels were helpful to the retarded children's improvement, suggests that these children were still in the process of developing sensori-motor schemas in regard to spatial relationships.

Hofmeister, A. Motor proficiency and other variables in educable mentally
29. retarded children. American Journal of Mental Deficiency, 1969, 74, 264-268.

Rationale

This study was designed to investigate the inter-relationships between motor proficiency and selected variables, including mental age, chronological age, school attainment, sociometric status, and classroom behavior in a selected sample of educable mentally retarded boys and girls. Specifically, the study was aimed at answering the following questions. 1) Is motor proficiency related to school achievement in the areas of reading, writing and arithmetic? If such a relationship does exist can this be accounted for in terms of variance due to factors other than those included in mental and chronological age? 2) Is motor proficiency related to sociometric status? 3) Is motor proficiency related to estimates of behavioral disturbance?

Subjects

The subjects consisted of thirty-one intermediate level educable mentally retarded children. The Ss ranged in age from 126-163 months and MA from 69-116 months.

Method

The measure of motor proficiency used was the Lincoln-Oseretsky Motor Development Scale. The Wide Range Achievement Test was used to measure academic achievement in reading, spelling and arithmetic. The checklist used for assessment of behavioral disturbance was constructed for use by class teachers in elementary schools. It is composed of fifty statements concerned with observable behaviors. The sociometric ratio of each subject was determined by the individual administration of a questionnaire to discover with whom the individual preferred to work and play. The mental ages were calculated from WISC full scale scores.

Results

The correlation between motor ability and arithmetic was .756 which was statistically significant at the .01 level. When the effect of chronological and mental age was partialed out, the resultant coefficient was .669 which was still significant. The correlations between motor proficiency and reading, and motor proficiency and spelling were .214 and .320. When the sum of the results from the reading, spelling, and arithmetic tests were correlated with motor proficiency, the relation of .456 obtained is significant at the .01 level. The coefficient of correlation between motor proficiency and the sociometric scale scores was .502 which was significant at the .01 level. The overall estimate of behavioral disturbance, when correlated with motor proficiency does not show a significant relationship (.036). A chi-square analysis of the mild and severe subdivisions against the motor proficiency quartiles showed that the subjects high in motor proficiency tended to have a higher incidence of more severe forms of behavioral disturbance.

Conclusions

There is a relationship between motor proficiency and arithmetic achievement which cannot be accounted for in terms of common relationships with mental and chronological ages. A relationship exists between motor proficiency and sociometric status measured in the class setting. The level of motor proficiency is related to the incidence of more severe forms of behavioral disturbance, although there is no indication of an overall relationship between motor proficiency and behavioral disturbance.

30. Jarvis, P.E. Verbal control of sensory-motor performance. *Human Development*, 1968, *11*, 172-183.

Rationale

Luria has proposed a sequence of three major stages in the development of the use of speech to direct one's behavior. During the first stage, the child is able to speak, to pronounce words correctly, and to understand their meaning; but he is not able to use speech to direct his own behavior. The speech of others, however, can direct and control his behavior to some extent; i.e., it is possible to initiate, but not to inhibit action by the very young child (under two years of age) by means of verbal directions.

During the second stage, the child can use his own speech to control his behavior to some extent. The child's speech has a motor component to it which, Luria says, has an impulsive function. It helps initiate an act of motor behavior, but will not inhibit it, regardless of the semantic content of the speech. At this stage, even if the semantic content of the speech is negative or inhibiting, e.g., "don't push", the speech will have an impulsive rather than an inhibiting action; i.e., the child will push despite his countermanding verbalization. It is only in the third stage that the semantic side of the child's speech begins to become dominant. However, as this occurs, the overt speech is no longer needed, because the child has internalized this directive speech-for-self. This study tested one of the basic hypotheses proposed by Luria, the hypothesis that there is a stage in development during which instructing a child to verbalize - to give himself instructions - while he is performing a sensory-motor task will improve his performance if he tells himself what not to do.

Subjects

Seventy-two subjects participated in this experiment. All of them were either in nursery school, kindergarten, or first grade. The mean age of Group I Ss was 46.8 months. All Ss were of at least normal intelligence with no known sensory or speech defects.

Method

Three conditions were used. In the "silent" condition S was told to push the button whenever he saw a blue light flash on and to refrain from pushing whenever he saw a yellow light flash on. In the "push" condition, he was told to say "push" and then push whenever the blue light flashed on, and to remain silent and refrain from pushing whenever the yellow light came on. In the "don't push" condition, he was told to push whenever the blue light came on without saying anything, and to say "don't push" whenever the yellow light came on. Each S received all conditions.

Results

In analysis of variance terminology it is clear that Luria's hypothesis would predict a significant age by conditions interaction. Only one of the AXC interactions approaches significance, and the interaction is not of the predicted sort.

Conclusions

The results clearly do not support Luria's hypothesis. Because the particular hypothesis being investigated here is a key one in Luria's overall theoretical scheme, the failure to confirm it leaves some major questions wide open once again. Whatever function the speech-for-self of young children may serve there is serious doubt that it plays a major role in the establishment of cognitive control over sensory-motor behavior.

31. Jenkins, E., & Lohr, F.E. Severe articulation disorders and motor ability. Journal of Speech and Hearing Disorders, 1964, 29, 286-292.

Rationale

Speech pathologists have shown an historic interest in the possibility that poor muscle coordination is associated with an individual's failure to develop articulate speech at the usual age and through the usual processes. Scientific studies have established no clear relationships between motor ability and speech ability. The purpose of the study reported here was to investigate differences in motor abilities between groups of children with and without severe articulation disorders; using a test instrument that would permit evaluation of a broad range of types and degrees of motor ability and employing a practical, limiting definition of "severe articulation disorder".

Subjects

Forty experimental and 40 control children were studied. To be eligible for the study, children had to be in first grade, of first-grade age, and within a normal mental ability range (above 80). They were to have no known emotional or physical disabilities. All children with "severe" articulation defects who met the above criteria qualified for the experimental group. The intent of the authors was to study a group of children in whom speech intelligibility was impaired by poor articulation. Children qualified for the control group if they had no history of speech defect.

Method

The Oseretsky Tests of Motor Proficiency, which test motor ability in six categories and at ten age levels and yield a single score that can be expressed as a motor quotient were considered feasible forthe experiment. To obtain two matched groups, each experimental subject was paired with a control subject of the same sex, age within four months, and intelligence quotient within 6 points.

Results

Comparison of the intelligence quotients of the control group with those of the experimental group produced a t score of .098 which is without significance. Comparison of the motor quotients produced a t score of 2.81 which is significant. For the experimental group the correlation between IQ and MQ was -.18; for the control group the correlation between IQ and MQ was +.31. When the mean motor ages for each of the five categories were compared the trend in total motor quotients was repeated. The control group consistently excelled the experimental group. The control group also tended to excel the experimental group in each task at each age level.

Conclusions

The central conclusion of this experiment is thatchildren with severe articulation defects do on the average have more difficulty in motor proficiency, as measured by the Oseretsky tests, than do children without severe articulation disorders. It was further concluded that, despite some disadvantages, the Oseretsky Tests of Motor Proficiency have potential as a clinical and research tool. These authors believe that no direct cause and effect relationship can be hypothesized between behavior on a particular motor task and an articulation problem. What seems to be indicated is the need for further analysis of areas of ability and disability with a view toward the eventual identification of organic etiologies that might account for both the articulation disorder and the motor disabilities.

32. Johnson, W.R., Fretz, B.R., & Johnson, J.A. Changes in self-concepts during a physical development program. *The Research Quarterly*, 1968, *39*, 560-565.

Rationale

The present research was undertaken to investigate the changes that occur in the children's self-concepts and ideal self-concepts during a clinic program. It was the position of the writers that the children in the physical developmental program would show decreasing self-concept -- ideal self-concept discrepancies. The present research focused on three aspects of the self-concept: the body, interpersonal relationships, and activity orientation. More specifically, the following hypotheses were postulated: a) the children's self-concepts of their bodies will be significantly closer to their ideal body images in postclinic testing as compared to preclinic testing; b) the children's self-concepts of interpersonal relationships will be significantly closer to their ideals for these relationships in postclinic testing as compared to preclinic testing; c) the children's self-concepts of orientation to solitary task, and group activity will be significantly closer to their ideal orientations in postclinic testing as compared to preclinic testing.

Subjects

The children in the present research included 63 males and 11 females ranging in age from four to seventeen, with a median age of nine. Referrals indicated that there were 28 emotionally disturbed, 31 mentally retarded, 15 brain damaged. Additionally, 19 of the children were labeled hyperactive and 12 as aggressive. The children attended the clinic two days a week (1-2 hours per day) for a six-week period during the summer.

Method

The clinic provided conditions which included individualized, systematic, play-oriented neuromotor-perceptual training. The children attended an evaluation session both before and after the clinic program. During these sessions, the children were administered a series of measures, including measures of perceptual-motor skills and three measures of self-concept. These three measures of self-concept were developed especially for the clinic program.

Results

A comparison of preclinic and postclinic scores indicated the following changes: a) decrease in self--self-ideal discrepancy on height; b) increase in willingness to be with larger groups of children; c) increase in willingness to be near the clinician; and d) increase in desire (self-ideal) to be near the father. No significant changes occurred with respect to weight, arm length, leg length, or activity orientation. The only significant change was a decrease in the discrepancies in the height category. All other changes in discrepancies were not only insignificant but also in the opposite direction from that hypothesized.

Conclusions

Although the present data must be viewed tentatively until the instruments are further standardized, the presence of notable changes in the children, as indicated in the present research by parents, clinicians, and the children themselves as seen through changes in their self-concepts, strongly suggests that an individualized physical developmental program can be of significant value in the total functioning of the child.

33. Johnston, M.K., Kelley, C.S., Harris, F.R., & Wolf, M.M. An application of reinforcement principles to development of motor skills of a young child. Child Development, 1966, 37, 379-387.

Rationale

This paper resents a study that was part of a program of research in the experimental application of reinforcement principles to the guidance of nursery school children. Results have indicated that reinforcement techniques be effectively applied in field conditions to change various kinds of behavior. The purpose of the present study was to determine whether similar procedures could be used to induce a 3-year-old boy to engage in vigorous play activity on a piece of climbing equipment. Increasing the child's use of one piece of climbing equipment seemed an appropriate step toward the ultimate objective of fostering the development of the child's physical skills.

Subject

Mark was one of the 12 children enrolled in the 3-year-old group at the Laboratory Preschool and was 3 years and 8 months old when the study began. It was apparent during the first 6 months of school that he spent very little time engaging in physical activity of any kind. He avoided most of the climbing equipment, such as boards, ladders, and boxes; and he almost never used the piece of outdoor equipment referred to as the "large climbing frame".

Method

The procedures for getting the child to play on the climbing frame consisted of making adult social reinforcement contingent solely upon his use of this piece of equipment. Social reinforcement was defined as follows: a teacher standing within 10 feet (the length of the climber) of the subject and watching, speaking to, smiling at, or touching the child, or bringing him supplementary equipment to amplify his play on the climber. Withdrawing or withholding social reinforcement consisted of the teacher's turning away, not looking or smiling at the child or speaking to him, and focusing her attention elsewhere. The study was carried out in five phases: Baseline; First Reinforcement-continuous social reinforcement was given whenever the subject was using the climbing frame and was withheld whenever he engaged in other activities; Reversal-contingencies for delivery of reinforcemnt were reversed to ascertain whether the contingency employed (adult attention) was a significant variable in any change in climbing-frame behavior observed in the first reinforcement period; Second Reinforcement-continuous social reinforcement for climbing frame behavior was again instituted; Generalization-the reinforcement schedule for climbing frame behavior was gradually shifted from continuous to intermittent, and all other physical activity was likewise intermittently reinforced.

Results

Climbing frame behavior rapidly increased in response to continuous reinforcement. By the ninth day of this schedule, climbing frame behavior comprised 67.4 percent of his outdoor play time. The overall percentage of time spent on the climbing frame during the reversal phase was 12.3 percent. Reinforcement for climbing frame behavior was then reinstituted. The behavior reconditioned rapidly, reaching a high rate of over 50 percent on the first day of the phase. During the generalization phase climbing behavior spread to all the climbing equipment in the yard, that is, ladders, suspended and inclined boards, packing boxes, trees, and other frames. It appeared that, along with the planned manipulation of Mark's climbing frame behavior, desirable modifications had occurred; his social and verbal behaviors increased, enabling him to interact more effectively with his peers.

Conclusions

The results of this study indicate that overcoming avoidance behavior in relation to a play activity on a piece of equipment is modifiable by operant conditioning techniques. They also suggest that the interests of a group of children in one type of activity can be influenced by the amount of adult social reinforcement directed toward this activity.

34. Keogh, B.K., & Keogh, J.F. Pattern copying and pattern walking performance of normal and educationally subnormal boys. *American Journal of Mental Deficiency*, 1967, *71*, 1009-1013.

Rationale

This study was concerned with children's ability to copy simple two-dimensional patterns by drawing and walking. Most pattern copying tests are paper and pencil tasks, requiring the child to reproduce a drawing of relatively small size within a relatively limited area. It is possible that certain aspects of visual, spatial organization may be affected by the nature of the task, and that other aspects of visuo-motor ability might be elicited in an expanded spatial field. Pattern walking requires that the child reproduce a model or copy in a less well structured and larger space, and that his own gross movements represent the pattern. The present study compared pattern copying and pattern walking performance of normal and educationally subnormal boys.

Subjects

Sample A consisted of 39 boys, ages nine and ten, who were designated educationally subnormal. Sample B (N=84) came from one regular elementary school of middle socio-economic level.

Method

Each child was seen individually in an empty classroom, seated at a desk, and asked to draw pencil copies of simple line patterns: a circle, square, triangle, diamond, and an open-ended figure. On the day after drawing the designs, each child was seen individually in a large empty room in the school and asked to make the same patterns by walking.

Results

On pattern drawing, differences between the six year and both the eight and nine year groups reached statistical significance. Differences for these age groups on pattern walking were also significant. The ESN group had the poorest, that is the lowest, mean score of all the groups on both copying and walking. Although the ESN subjects were all nine and ten years of age chronologically their mean scores were similar to those of the six year old boys.

Conclusions

The findings suggest thatmost children can make good copies of simple designs, both drawing and walking, by the seventh or eigth year. However, it was clear that the pattern walking presented an especially difficult problem for the ESN children; although they were nine and ten years of age chronologically, their performance was similar to the six year old normal boys. The retarded subjects had serious difficulty in translating the visually perceived pattern into a larger spatial-temporal activity. They appeared unable to organize the space and their own movements in it. Although they had some success at drawing the designs on paper, they had more serious difficulty when required to transpose the stimuli to a larger spatial plane, to define points of reference within the space, and to orient themselves both spatially and temporally according to these visual cues. That is, they appeared to have real disturbance in making the appropriate sequence of motor responses to the visual organization of space.

35. Keogh, J., & Benson, D. Motor characteristics of underachieving boys. *The Journal of Educational Research*, 1964, *57*, 339-344.

Rationale

The purpose of the present study was to describe certain specific motor characteristics of underachieving boys of adequate intelligence and to determine if these boys differed significantly from normative data in relation to these variables. It was hypothesized that a group of underachieveing boys with adequate intelligence would have a disproportionate number of boys with less than expected skills but that not all boys in the group would score low.

Subjects

The subjects were 43 boys who ranged in age form 10 to 14 years. The IQ of the boys as measured on the WISC ranged from 83 to 122 with a mean score of 103. The average underachievement was 1.5 grades. The division of the total group of boys into two sub-groups was for the purpose of comparing differences between age groups.

Method

The test battery consisted of the 50-yard dash, shuttle run, situps, standing broad jump and ball throw as defined for use in the AAHPER Youth Fitness Tests, vertical jump and grip strength, and the Kraus-Weber Tests. These tests were used to measure elements of speed, body control, and strength.

Results

The older boys were average or in some instances better than average in performance with no serious lacks being evident, either as a group or as individuals. This was in marked contrast with the younger boys who had adequate measures of strength and body control, except for grip strength, but were very low on speed and ball throwing performances. One-half of the boys in Group I performed adequately or better on the five AAHPER tests in contrast to the remaining one-half of the boys who were consistently low on all but perhaps a single measure.

Conclusions

The performance of the younger boys supports the primary hypothesis "that a group of underachieving boys would have a disproportionate number of boys with less than expected physical skills but that not all boys in the group would score low." However, the performance of the older boys clearly does not support this statement. The differences in performance between the 10-12 year old boys and the 13-14 year old boys establishes age as an important differential in describing the motor characteristics of the Clinic School boys and does not support the original hypothesis that younger and older boys would demonstrate similar motor characteristics. If generalized failure is a central problem in children with learning disorders, one-half of the younger age boys seem destined to compound and support their learning disorders by problems which they have in terms of physical performance.

36. Kershner, J.R. Doman-Delacato's theory of neurological organization applied with retarded children. Exceptional Children, 1968, 34, 441-450.

Rationale

Delacato (1959, 1963, 1966) and Doman, Spitz, Zucman, Delacato, and Doman (1960) make inferences without substantive experimental support connecting motor functions to cognitive competencies. They have explicated a developmental sequence of motor and perceptual experiences that they say is vital for normal child development, and they prescribe these activities in their program of treatment for children with neurological dysfunction, the scope of which, they say, includes the vast majorityof children now considered mentally retarded. The present investigation was prompted by the lack of definitive research upon which the conscientious educator could formulate an objective opinion as to the efficacy of the Doman-Delacato physical therapy program. The purpose of this investigation was to determine the effects of a structured program of physical activities upon the physical and intellectual development of TMR children. Following hypotheses were tested: 1) that creeping and crawling performance improves through participation in a program of neurological organization (that includes creeping and crawling); 2) that recapitulation of early perceptual motor developmental sequences is prerequisite to and improves the performance of more sophisticated perceptual motor skills not practiced; 3) and that improvement in psychomotor functioning should be accompanied by improvement in cognitive functioning.

Subjects

Ss consisted of TMR children: 16 control and 14 experimental subjects. One of the two classes was arbitrarily selected as the experimental group. CAs ranged from 8 to 18 years in the E group and 8 to 17 years in the C group.

Method

The teacher of the E group attended a seven day orientation course offered by the Institutes for the Achievement of Human Potential in Philadelphia. An experimental program of rhythmical balance and coordination activities was designed for the control group. The program extended for 74 consecutive teaching days. Experimental Treatment: the entire school curriculum, five and one-half hours per day, involved activities consistent with the Doman-Delacato theory of neurological organization. Control Treatment: the entire school curriculum, five and one-half hours per day for the control group, involved nonspecific activities designed to achieve better rhythm, balance, coordination, and body image. The children were given attention approximately equal to that received by the experimental group. This was the author's attempt to control for the Hawthorne Effect. All children were pre and post tested on the PPVT, the Vineland-Oseretsky Motor Development Test and the Creeping-Crawling Scale of the Doman-Delacato Developmental Profile.

Results
The results from Hypothesis I supported a very basic assumption of the Doman-Delacato position, i.e., that creeping and crawling performance improves through participation in creeping and crawling activities. The results from Hypothesis II did not support an explicit contention of the Doman-Delacato position, i.e., that recapitulation of early perceptual motor developmental sequences is prerequisite to the performance of more sophisticated perceptual motor skills that are not practiced. Hypothesis III was supported. Caution should be exercised in interpreting the results from Hypothesis III that tend to support the Doman-Delacato theoretical position.

Conclusions
The three hypotheses were chosen to test the Doman-Delacato theory of neurological organization as it applies to trainable mentally retarded children. Some basic assumptions of the theory were supported, and the experimental treatment appeared to have a facilitating effect upon the intellectual development of the children who participated in the experimental group activities. The lack of significant difference between groups in motor development and the motor improvement exhibited by the control group question the validity of the Doman-Delacato contentions that ontogenetic development consists of an invariant sequence of stages, and that proficient motor functioning at higher levels is dependent upon successful completion of lower levels.

37. Knights, R.M., Atkinson, B.R., & Hyman, J.P. Tactual discrimination and motor skills in mongoloid and non-mongoloid retardates and normal children. American Journal of Mental Deficiency, 1967, 71, 894-900.

Rationale - Study I
The first study investigates the tactual skills of mongoloid and non-mongoloid retardates on a variety of discrimination tasks. The second study compares the performance of mongoloid and non-mongoloid retardates on several motor tasks and relates the test scores to data obtained from normal children. Consistent with the postulated greater hypotonia in mongoloids, it is predicted that mongoloid Ss will perform significantly poorer than matched non-mongoloids on both tactual discrimination and motor tasks.

Subjects
Ss were 19 mongoloid and 19 non-mongoloid retardates matched for sex, IQ and CA. The mean Stanford-Binet IQ for the mongoloids was 41 and the mean non-mongoloid IQ was 42. The mean age of the mongoloids was 14.7 years (range from 7.6 to 24) and the mean age of the non-mongoloids was 15.1 years (range

from 8.9 to 20.7). The mean MAs were 3.3 years for the mongoloids and 4.1 years for the non-mongoloids. The non-mongoloids group were all considered as cultural familial retardates.

Method
Ss were required to perform in one sitting, five short individual tasks: texture discrimination, size discrimination, weight discrimination, kinesthetic discrimination and visual-tactual discrimination.

Results
The results suggest that fewer mongoloids, who are matched with non-mongoloid retardates on CA and IQ, are able to perform tactual and kinesthetic discrimination tasks. The results of this study do not support the postulated greater hypotonia of mongoloids.

Rationale - Study II
In order to reduce the chance that the results of this study were influenced by the poorer comprehension on the part of the mongoloids, a second study was conducted in which the tasks were simplified so that very little conceptual thinking was required. The tasks chosen were various motor tasks which had simple instructions and could be performed by imitating the behavior of the E. In addition these motor tasks do not require discrimination and provide a more direct test of the hypotonia hypothesis.

Subjects
Twelve mongoloid and 12 non-mongoloid retardates not used in Study I were matched for sex, MA, and CA. The mean CA of both groups was 14.2 years. Mean MA for the mongoloids was 3.5 years while the mean MA of the non-mongoloids was 4.1 years.

Method
Three experimenters administered six motor performance tests to each S. The motor tests were presented as follows: Maze Coordination Test, Hand Steadiness Test, Dynamometer Test, Grooved Pegboard Test, Simple Reaction Time Test, and Tapping Test.

Results
The results of all these analyses indicated no significant differences between performance of the mongoloid and non-mongoloid retardates on any of the measures.

Conclusions
In general, no significant differences were found between the performance of mongoloid and non-mongoloid retardates. This finding does not support the hypothesis that mongoloid children have poorer motor skills than non-mongoloid retardates who are matched on CA and MA. The comparison of the data collected on normal children with that of retardates is relevant to the hypotonia hypothesis. On all of the timed tasks the retardates performed less rapidly and with more errors than the normal children. Performance on the dynamometer, the only untimed task, was similar for both retardates and normals. This suggests that muscular strength, when coordination is not required, is not affected by the hypotonia observed in many retarded children. In summary, the results of both studies do not support the suggestion that mongoloid retardates are characterized by a greater degree of hypotonia than other retardates. The present results suggest that when purely motor skills are compared, with little need for conceptual understanding, the performance of mongoloid and non-mongoloid retardates is similar.

38. Leithwood, K.A., & Fowler, W. Complex motor learning in four-year-olds. *Child Development*, 1971, *42*, 781-792.

Rationale

The main objective of this study was to examine some of the limits of complex gross motor learning attainable by 4-year-old children using standard gymnastic tasks and sequences. It was expected that past forms of environmental stimulation would influence ability to learn and that there would be significant relations between gross motor ability and psychosocial adjustment as well as specific cognitive abilities. Little relation was expected between motor ability and general intelligence. The framework for conceptualizing complex gross motor learning was derived principally from a general model for guiding cognitive learning developed by Fowler. The model for guided stimulation is divided into two major processes, the structure of a learning situation (tactics) and the developmental presentation of a sequenced curriculum (strategies). The organization of a learning session is based upon presenting stimulus patterns through developmentally adapted, language-guided, perceptual-motor modeling and child experimentation. Strategies for organizing a curriculum sequence consist ofanalyzing a concept hierarchy into component elements and relations. Simple units and relations are then ordered according to structural-functioning principles, combining component units in multiple relationships to form concrete (part-whole) network and hierarchical systems. In motor learning, like cognitive learning in general, however, the formation of complex mediational networks and hierarchical structures (schemata) according to rule relations is an essential feature of the learning process. Cognitive processing is an indispensable aspect of learning and functioning in all domains, tending to come more into prominence during learning and other critical phases of any process and less during practice and review. Many motor activities are organized into repetitive routines, however complex the rule structures of which they are formed, lending themselves to great automaticity in their rendition. It is probably this apparently effortless, automatic quality characterizing most well-mastered motor acts which is partly responsible for historical neglect of the powerful role of cognitive mediation in motor tasks. Gymnastic activity consists of intricate systems of head, arm, leg, and trunk movements which must be hierarchically integrated and sequentially coordinated, often in asynchronous patterns. This organization of a complex skill structure through combining actions in tasks which are organized in subroutines and in turn patterned in complex routines suggests that gymnastics is an area of complex gross motor learning which is highly dependent upon cognitive mediation and regulation. Further, since a large proportion of basic components (walking, jumping, turning) are already well mastered by many 4-year-old children, gymnastic activity would seem to be a prime area to explore the potential of young children to acquire complex cognitive schemata.

Subjects

Twenty-four 4-year-old nursery school children, 16 boys and eight girls, participated in the study. While all subjects ranged in intelligence from average to above (pretest mean Binet IQ advantaged = 126, disadvantaged = 117), six attended a school for socially disadvantaged children and 12 attended a school for advantaged children.

Method

The children were divided into four groups of six. Two groups were given gymnastic training, one group was given music training, and a fourth group was given no training. Groups were balanced as closely as possible on motor abilities and Binet IQ. The gymnastics program (T_1) was conducted three times weekly for a period of 15 weeks. Each session lasted as long as subjects remained motivated, to a maximum of 30 minutes. The objectives of this program were for each subject to be able to perform any eight of 16 selected, complex gymnastic tasks and coordinate these tasks in such a way as to be able to perform two different routines. Both simple and complex levels of motor learning achievement were measured with all subjects using two instruments. One, a Test of Structural Dymanics, included a number of activities quantified in terms of five simple, physical abilities (strength, balance, coordination, energy mobilization, flexibility) needed to perform all gross motor tasks. The other, a Test of Gymnastic Sequences, measured the extent to which simple motor abilities were cognitively organized into a sample of movement patterns, in this case, drawn from sequences of gymnastic movements included in the motor training program. A measure of field independence was used to examine the relationship between motor learning and the specific cognitive ability of analysis. Psychosocial adjustment was measured by three independent ratings of each child, made by nursery school teachers.

Results

The motor-trained groups made mean gains in complex, gross motor skills (Test of Gymnastic Sequences) almost five times as great as the mean gain scores of groups who received no motor training. In contrast, there was almost no difference betweenthe mean gain scores of the two groups on simple gross motor abilities (Test of Structural Dynamics). Taken independently, each of the separate motor-trained groups made mean gains in gymnastic skills on the order of three and 10 times as great for the advantaged, motor-trained group compared with the musically trained and untrained advantaged groups, and three and nine times as great for the disadvantaged, motor-trained group compared to the advantaged, musically trained and untrained groups. All differences are significant. Again, there is little difference among any of the mean group gain scores in simple motor skills. Results concerning cognitive ability and motor learning indicate no significant relationship in terms of general intelligence. The pattern of findings is clearer in the case of psychosocial adjustment. All three training groups made significant pre to post test changes on at least two of the four subscales.

Conclusions

There are wide implications for developmental psychology and education in the children's acquisition of skills more complex than those found in the developmental norms recorded by Gesell et al, and never systematically challenged since. Clearly, Gesell's early maturational prescriptions were grossly out of timing in terms of readiness and markedly underestimating of the role of specific training in development. The only support for developmental views stressing maturation and general experience to emerge in this study are the findings on the basic factors common to all motor activity (Test of Structural Dynamics). Regardless of the amount and type of motor or other training, changes in these dimensions were similar and trivial in all groups. Skills of this basic and simple type would appear to be heavily dependent upon intrinsic growth patterns and therefore phylogenetic in character.

39. Levy, J. Social reinforcement and knowledge of results as determinants of motor performance among EMR children. American Journal of Mental Deficiency, 1974, 78, 752-758.

Rationale

This study was concerned with the role of two forms of feedback (social reinforcement and knowledge of results) in the acquisition of motor skills among EMR children. Distinguishing between motor tasks which demand accuracy as opposed to tasks which demand speed, Martens (1971) suggests that social reinforcement may affect speed while knowledge of results may affect accuracy in normal children. The unrealistically low generalized expectancy success and higher expectancy of failure among EMRs may dramatically increase the motivational importance of social reinforcement regardless of motor task requirement. This investigation was designed to determine the effects of four social reinforcement incentives (tangible, praise, reproof and control) and the presence or absence of knowledge of results on motor performance of EMR children.

Sample

Eighty EMR boys and girls, MA 5.0-10.3 years, CA = 8.2-14.0 years with no gross motor or sensory dysfunction or emotional disturbance.

Method

A 2X4X6 factorial design (presence or absence of knowledge of results, four social reinforcement conditions and 6 blocks of 15 trials) was used. The motor task was tracking a moving light on a Lafayette Photoelectric Rotory Pursuit Apparatus.

Results

Analysis of variance indicated all main effects and three way interaction significant. There was a linear improvement in performance across trials under all conditions. Motor performance improved in all social-reinforcement conditions to a greater degree when knowledge of results was present than when it was absent.

Conclusions

This study clearly points out that information feedback in the form of social reinforcement and knowledge of results has a great influence on the accuracy of motor performance of EMR children. Social reinforcement is of significant importance in accuracy of motor task performance of EMRs as compared to its lesser effect on normals in accuracy of motor performance. The tangible social reinforcement condition was the most stimulating motivational incentive.

40. Lillie, D.L. The effects of motor development lessons on mentally retarded children. American Journal of Mental Deficiency, 1968, 72, 803-808.

Rationale

Despite the fact that MR children have motor deficiencies when compared with normal children, there is no empirical evidence which defines the precise "motor educability" of retarded children. This study was designed to determine the effects of a diagnostically based motor development program on the motor proficiency of mentally retarded culturally deprived children of *preschool* age. It was hypothesized that preschool children given motor lessons as part of an experimental kindergarten program would show a significant improvement in *fine* and *gross* motor skills and that this improvement would be significantly greater than any improvement among children receiving general kindergarten motor experiences or among children not exposed to any kindergarten experiences.

Sample

All children were between the ages of 57 and 70 months with SBIQ from 50-85. All children were lower class and diagnosed as free from any physical or sensory handicap and displayed no evidence of emotional maladjustment.

Method

Three groups of approximately 16 children were studied; 1) an experimental preschool group, 2) a kindergarten control group, and 3) a home control group. All children were pretested on the Lincoln-Oseretsky Motor Development Scale in September-October and posttested in May of the school year. The E group received a series of 65 highly structured motor development lessons developed by the author based on an analysis of the pretest profiles and Guilford's factor analysis of motor skills. Activities included cutting, pasting, folding, tracing, and gross motor games designed to remediate weaknesses in static balance, dynamic precision, gross body coordination, finger speed, arm and hand steadiness, precision and dexterity. The kindergarten children received a traditional K program which incidentally includes motor experiences. No specific time of day was devoted to motor lessons. The home control received no formal instruction.

Results

Analysis of covariance indicated no statistically significant differences in gross motor development among the three groups. There was a significant difference in fine motor proficiency with the experimental group superior to both controls. The K group was superior to the home control group.

Conclusions

The diagnostically based motor development lessons devised for this investigation appear to have a facilitating effect on fine motor proficiency of mentally retarded, culturally deprived children of preschool age. Further, the investigation of gross motor and fine motor proficiencies as separate entities appears to have much value for diagnostic remediation of motor deficiencies.

41. Loynd, J., & Barclay, A. A case study in developing ambulation in a profoundly retarded child. *Behavioral Research & Therapy*, 1970, *8*, 207.

Rationale

Ambulation deficits are fairly common among profoundly retarded children, and are usually the result of neurological impairment. The present paper describes the management of an ambulation deficit apparently resulting from an aberrant reinforcement history.

Subject
The subject, an eight-year-old female, was microcephalic and was classified intellectually as functioning within the profoundly retarded range. With respect to her developmental history relative to ambulation she was reported to have crawled at two years, pulled herself to an upright position at three, and to have occasionally taken steps at the age of four but never without the aid of furniture such as a table or chair to grasp. Both a neurological evaluation and a physical therapy evaluation revealed no demonstrable physical or neurological reason for her ambulation deficit and it was therefore decided that the deficit might be amenable to modification by behavioral means.

Method and Results
Accordingly, behavior shaping was begun on an approximately daily basis. Beginning with her known behavior repertoire, i.e., her ability to stand and to take a few steps while grasping the table edge, the therapist reinforced this behavior with M & M candies, and a variety of other primary reinforcers, gradually shaping the behavior to the point where the S would pull up on the table, walk around it and cross a short space to another table. Shaping and fading procedures with respect to successive approximations of independent walking were continued until the girl had attained independent walking behavior with the minimal aid of a string. The acquisition of this behavior required approximately 84 sessions.

42. Maccoby, E.E., Dowley, W.M., Hagen, J.W., & Degerman, R. Activity level and intellectual functioning in normal preschool children. Child Development, 1965, 36, 761-770.

Rationale
After citing a series of contradictory findings in the literature, E's posit that in measuring the effects of motor activity levels on IQ, a differentiation should be made between generalized levels of activity and the activity level resulting from the inhibition of activity when necessary to prevent interference in some task. One group of studies indicate that certain traits intuitively associated with activity, such as assertiveness and independence, and active environmental exploration are positively associated with measures of intellectual performance. Other studies have yielded results showing either no relationship or a negative one between measured level of activity and IQ. E's observe that these findings show some consistency if one notes that the negative relationships were obtained in situations where activity levels were measured during problem solving. This study focuses on two hypotheses arising from this view: "Total gross motor activity will be positively related to intellectual proficiency" and that "the ability to inhibit motor activity when required will also be positively related to ability scores".

Subjects
The group studied was composed of 21 boys and 20 girls, all between their fourth and fifth birthdays and attending the Stanford Village Nursery School. Although the researchers indicate "most" of the subjects were children of graduate students at Stanford University mixed with some "town" children, they neglect to state the exact proportion. They indicate that the average IQ of the group is high (135), adding that the range was 95 to 154. (SD=13.7).

Method

In this correlational study E's examined the relationship between measures of intellectual functioning and two types of activity measures: a measurement of general activity level and a measurement of the ability to inhibit movement during testing. Stanford-Binet Intelligence Scale and the Children's Embedded Figures Test (CEFT) were used to tap verbal and nonverbal components of intellectual ability. To establish general activity level each S wore a set of actometers, a wristwatch-like device, on one single occasion for "most of" a regular school session of "approximately two hours". The ability to inhibit motor activity was determined by adding standardized scores on three inhibition of movement tests. The tests involved drawing a line, walking down a walkway, and winding up a winch on a toy tow truck attached to a toy jeep. All three tests were administered to each S first under conditions without any instruction about the speed of performance, and then a second time with the instruction to do it slowly.

Results

E's first hypothesis that general activity level would be positively associated with measures of intellectual ability was not supported for either sex. E's report a positive relationship between the ability to inhibit movement and scores on the Stanford-Binet for both sexes combined of $r = .44$ ($p<.01$), as predicted by their second hypothesis. This positive tendency is also found in correlations between the CEFT and inhibition, but not at a level of significance.

43. Maloney, M., Ball, T.S., & Edgar, C.L. Analysis of the generalizability of sensory-motor training. American Journal of Mental Deficiency, 1970, 74, 458-470.

Rationale

While Kephart's theory of perceptual development and his correlated training program involve more than one level of functioning, the focus of the present research is only on theoretical and practical assumptions regarding sensory-motor training. In the present study the investigators sought to provide a more critical test of certain theoretical and practical aspects of sensory-motor training. Three specific hypotheses were tested, and are considered in turn below.

Body image: Subjects given sensory-motor training will demonstrate significant increases in body image development. Kephart has stressed the basic importance of a clear, accurate, complete picture of one's own body and its position in space.

Finger localization: Sensory-motor trained subjects will demonstrate significant improvement in finger localization after a period of specific training.

Attention-motivation: Attention-comparison subjects will demonstrate no significant increases on any measures.

Subjects
The subjects were 59 moderately and severely retarded institutionalized males. Mean ages for the sensory-motor training, attention-comparison, and no-treatment control groups were 13.7, 14.0, and 14.0 years, respectively. Mean IQs for the groups were 42.5, 43.4, and 41.3, respectively.

Method
Ss were screened for blindness and severe motor involvement, and then were assigned to one of three groups: sensory-motor training group (S-M); attention-comparison group (A-C); traditional no-treatment control group (N-T). The groups were stratified on the basis of ability level (the ward was divided into three levels) and diagnostic category. The S-M group was seen for 40-minute sessions, three days a week, over a two-month period. The mean number of training sessions was 20.4. Training followed the systematic procedures presented by Kephart. Three exercises were used in the present research: walking board, balance board, and "angels-in-the-snow". Construction of apparatus and procedures adhered strictly to Kephart's prescriptions. The A-C group was seen for 40-minute sessions, 3 days a week, over a two-month period. Subjects in this group engaged in a series of sedentary activities which, as compared to sensory-motor training, involved equivalent amounts of interpersonal interaction, actual physical contact with the experimenters, and incidental reinforcement for attending to, trying, and/or succeeding at the various tasks. The N-T group was pre and post tested with a two-month interval between tests. The following instruments were administered as pre and post test measures: Eye, Hand and Ear Test, Personal Orientation Test, (the present study incorporated both the Eye, Hand and Ear Test and the Personal Orientation Test as measures of body image), Finger Localization Test, Purdue Perceptual-Motor Survey.

Results
The results for the Purdue Survey showed a significant interaction indicating that changes over time differed for the three groups. A series of t tests revealed a significant increase in scores between pre and post test for both the S-M and A-C groups. However, a t test comparison of gain scores for these two groups indicated a significantly greater increase for the S-M group. The results for the Eye, Hand and Ear Test revealed a significant interaction which indicated that changes over time differed for the three groups. A series of t tests indicated that a significant increase in scores between pre and post test occurred only in the S-M group. The results for the Personal Orientation Test revealed a significant interaction indicating that changes over time differed for the three groups. A series of t tests indicated that both the S-M and A-C groups made significant pre-post improvements. However, a t test comparison of gain scores for these two groups indicated significantly greater increases for the S-M group.

Conclusions
The data support Kephart's proposal that sensory-motor training offers a child appropriate motor exercises which will guide in the development of a generalized body image. The present findings failed to support the hypothesis that generalization from sensory-motor training would occur in finger localization after a period of specific finger training.

Maloney, M.P. & Payne, L.E. Note on the stability of changes in body image due to sensory motor training. American Journal of Mental Deficiency, 1970, 74, 708. Eight months after the termination of training, the two measures were readministered to 16 sensory-motor trained subjects and 14 no-treatment control subjects. The present data indicated that gains due to sensory-motor training on two measures of body image remain stable over an extended period of time.

44. Martens, R. Internal-external control and social reinforcement effects on motor performance. The Research Quarterly, 1971, 42, 307-313.

Rationale
A common means for attempting to facilitate the acquisition of motor skills among children is the use of praise and reproof as social reinforcers. The experimental literature, however, does not clearly establish the facilitory or inhibitory effects of these social reinforcers on the acquisition or performance of motor skills. Studies suggest thatmany other variables mediate the influence of praise and reproof as social reinforcers. One such mediating variable receiving recent experimental attention, but not with motor behavior, is the "internal-external control of reinforcement" construct. As a personality variable, internal control refers to individuals who have a strong expectancy toward "the perception of positive and/or negative events as being a consequence of one's own actions and thereby under personal control." External control refers to individuals characterized as having a strong expectancy toward "the perception of positive and/or negative events as being unrelated to one's own behaviors in certain situations and therefore beyond personal control." The purpose of this study, then, was to determine if praise and reproof as social reinforcers differentially influenced the performance of a motor skill among young boys high in internal as compared to external control. Based upon Rotter's theorizing, when the reinforcement is seen as not contingent upon the subject's own behavior, the influence of social reinforcement should be less than when the reinforcement appears contingent upon his behavior. If external control subjects tend not to see their own behavior as causing the reinforcement, the occurrence of the reinforcement provides less information about the rightness of their behavior and their behavior will change less. This would be true of both praise and reproof as social reinforcers. It is hypothesized, therefore, that internal control subjects perceive social reinforcers as contingent on their own behavior which subsequently affects their motor performance. External control subjects, however, perceive the reinforcers as unrelated to their behavior, and as a result their performance is less affected. The direction of the effects of praise and reproof on motor performance is not predicted for the internal control subjects. The experimental literature does not provide sufficient consistency to render a directional hypothesis.

Subjects
The Bialer Locus and Control Scale was given to 172 nonhandicapped boys attending the fourth, fifth, and sixth grades of a public elementary school. Thirty boys scoring at each extreme of the scale were selected as subjects.

Method
A 2X3X8 factorial design, with repeated measures on the last factor, was used. The first factor was the organismic variable I-E control of reinforcements. The second factor was the three social reinforcement treatments, including a praise, reproof, and control group. The final factor consisted

of eight blocks of five trials each. I-E control subjects were randomly assigned to one of the three social reinforcement treatments. The task requirements for the child to roll a black hard-rubber ball up an inclined board to a target area in the center of the board.

Results

Results of both ANOVAs showed that all main effects and interactions were nonsignificant.

Conclusions

The effects of social reinforcement separately or interactively with the I-E control construct did not affect behavior on an accuracy motor task. The equivocal literature does not appear as equivocal when a distinction is made between the accuracy and speed of motor responses. The proposed explanation as to social reinforcement effects on motor behavior may be summarized as follows: Social reinforcement has greater potential to affect the performance of well learned motor responses than for skills being acquired, depending upon the motivation level of the individual at the time of performance.

45. Martens, R. Social reinforcement effects on preschool children's motor performance. *Perceptual and Motor Skills*, 1970, *31*, 787-792.

Rationale

The results of studies on social reinforcement effects on simple, repetitive motor behavior have been far from conclusive. While these findings are of interest, most motor behavior is not of this simple repetitive nature. At least the majority of motor behavior which is of greater interest deals with the quality (accuracy) of performance rather than the quantity (speed or rate) of performance. Little experimental research has focused on the influence of social reinforcements on the quality of motor performance. The present investigation determined the effects of positive and negative social reinforcement on the *quality* of motor performance among preschool children. In addition to positive and negative social reinforcement treatments, a combination positive-negative reinforcement treatment was used. The present study not only used a "no-comment" control group but also used an additional control in which E was not totally silent. Instead, E conversed with S about his school activities, home, etc., while avoiding any reference to his performance.

Subjects

Ss were 25 boys and 25 girls ranging in age from 3 to 5 years attending a preschool nursery.

Method

The motor task required the child to roll a tennis ball up an inclined board to a target area in the center. The board was 6 feet long and 18 inches wide. Positive and negative social reinforcement as well as the combined treatment, were administered on a contingency basis. That is, for the positive treatment, as Ss improved their performance over the previous trial they were given one of four praise comments. The combined group received praise when improvement was made and were reproved when performance decreased. For the positive group as well as the combined group, praise was always given when the target was struck. For the negative reinforcement group and the combined group, reproof was always given when either extreme was scored. The no-comment control group performed without receiving any evaluation from E visually or verbally. In the second control group, E continued a casual conversation with S between blocks of three trials. Discussion about school, playmates, etc., were the topics. No evaluative reference to the child's performance was made. Ss were given 40 trials with a two minute rest after trials 12, 24, and 32.

Results

The 40 trials were grouped into eight blocks of five trials each for analyses. Boys, overall, were only slightly long, while girls were considerably short. The Social Reinforcement factor was not significant, nor was theSex X Social Reinforcement interaction.

Conclusions

Of greatest relevance to this investigation was the failure to find significant differences among the five social reinforcement treatments. Although the results from studies using simple repetitive motor tasks have been equivocal regarding the effects of positive and negative social reinforcement, they have, in general at least, found significant differences from control groups. The present study has failed to find significant social reinforcement effects when performing a complex motor task which emphasizes the quality or accuracy of the performance. It appears then that social reinforcement influences the quantitative dimension of the motor behavior but is not a significant influence on the qualitative dimension.

An explanation for the apparent failure of either positive or negative social reinforcement to affect the quality of performance resides in the degree of control that S has to vary his performance. Simple repetitive tasks are well-learned, and therefore S has at his command the full range of variability of performance. In experimental studies assessing the effects of social reinforcement on the quality of motor performance, the task has been a novel, unlearned skill. The range of variability in performance which is at the command of S for these tasks is considerably less. The opportunity for positive or negative social reinforcement to act as an incentive, therefore, is considerably greater when performing motor tasks which are well-learned and the quantity dimension is emphasized as compared to those not yet well-learned and the quality dimension is emphasized.

46. McCormick, C.C., & Schnobrick, J.N. Perceptual-motor training and improvement in concentration in a Montessori preschool. Perceptual and Motor Skills, 1971, 32, 71-77.

Rationale

The present study was undertaken to test the hypothesis that children in a Montessori preschool who also received perceptual-motor training would show increases in attentional processes and that children in the same Montessori setting who do not receive the additional training, would not show such increases. They also expected gains in the development of the body-image and

and an increase in ego-control along with concomitant decreases in impulsivity and overcontrol.

Subjects

The experimental group included 16 boys and nine girls, with an average age of 4.4 years (range 3.3 to 5.8). The control group was composed of 10 boys and 14 girls, with an average age of 4.3 years (range 2.9 to 5.7).

Method

The children were divided into two groups on the basis of attendance in the morning or afternoon classes. The morning group received the perceptual-motor training which was incorporated into the regular curriculum so that there was no particular difference in the amount of time or attention devoted to the two groups. The children were tested prior to the beginning of the experiment, on the following tests: 1) the Peabody Picture Vocabulary Test to assess the Verbal IQ; 2) the Goodenough-Harris Draw-A-Person Test to assess the Nonverbal IQ and to obtain an estimate of the adequacy of the children's body-images; 3) the Auditory-vocal Sequencing subtest of the Illinois Test of Psycholinguistic Abilities, a digit-span test, which is basically a test of attention; and 5) the Arrow-Dot Test of the IES Test to assess impulsivity, ego-control, and overcontrol. The children were retested 7 months later. The experimental group received one-half hour of perceptual-motor training, three days a week, for the 7 months of the study. The training consists of a developmentally organized series of gross and fine motor exercises. The movement-patterns used involve head turning, arm-sweeps, crawling, creeping, walking, jumping, etc. They make very little demand on physical strength or endurance; rather stress is on accuracy of movement and concentration. They tried to develop the capacity to control activity on demand. This control is gradually internalized following the sequence explicated by Luria: 1) control by others through speech; 2) control by self through external speech; 3) control by self through internal speech. Several techniques are used to develop auditory attentionor concentration. The control group received only its regular Montessori training.

Results

The differences in the mean scores for both the auditory and the visual tests of attention were statistically significant, in favor of the experimental group. The IQ differences between the groups were minimal both before and after training, indicating no special effect of the experimental treatment on these two measures.

Conclusions

In conclusion, the data suggest that the basic hypotheses can be accepted, at least provisionally. The experimental group showed an increased capacity for both auditory and visual attention spans and increased ego-control as measured by the Arrow-Dot Test well over that of the control group. Therefore, the perceptual-motor training seems a useful adjunct to Montessori preschool training.

McManus, D.L. Pursuit-rotor performance of normal and retarded children in
47. four verbal-incentive conditions. Child Development, 1965, 36, 667-683.

Rationale

The present study was designed as an attempt to provide more clarity with regard to the relative effects of praise, reproof, competition, and neutral social incentives on both the accuracy and the persistence of children's performance. Both normal and retarded children were included in the study to investigate the possibility of differential effects of these four incentives on the performance of the two groups. Children of both sexes were included to permit cross-sex comparisons of the effects of these four incentive conditions on their performance.

Subjects

The normal Ss were 24 public school boys and 24 public school girls of average intelligence (85-115 on the Lorge-Thorndike Intelligence Tests), who were in the fifth and sixth grades. The retarded Ss were 24 boys and 24 girls (58 to 85 IQ on the Peabody Picture Vocabulary Test) who were in residence at a state school for retarded children. The assignment of Ss to the treatment groups was solely on the basis of the pretest performance, and no attempt was made to match the treatment groups for CA and IQ.

Method

The present study utilized a three-factor treatments-by-levels design. One factor (A) is varied within levels, while the other two (B and C) are between levels dimensions. The within dimension consisted of the four treatment conditions: neutral , reproof, praise, and competition. The two between dimensions were level of intelligence (normal and retarded) and sex. The within levels, or treatments, dimension was formed by randomly assigning Ss, who were matched by pretest performance on the experimental task, into the four treatment conditions. Through this procedure the Ss in the four treatment conditions were equated for level of pursuit-rotor performance within each sex X IQ group at the outset of the study. A Lafayette Model 203 pursuit-rotor apparatus was employed in the experimental task. After each S's index of pursuit-rotor performance had been established, each IQ X sex group was divided into four treatment groups. The Ss in the IQ X sex group were then randomly assigned to the four treatments, and so on until all 24 Ss in each IQ X sex group had been assigned to one of the treatment conditions in this manner. This procedure resulted in four treatment groups of six Ss each, matched by Ss at six levels of pretest performance, within each of the four IQ X sex groups. The four treatment conditions were: 1) Neutral, 2) Reproof, 3) Praise, and 4) Competition.

Results

The results reveal a significant over-all difference in accuracy between IQ le[illegible] when both sexes and the four treatment conditions are combined. The normal Ss performed with higher accuracy than did the retarded Ss. It is important to note here that this difference in accuracy between IQ levels existed in the pretest as well as in the experimental treatment sessions and should not be attributed to any change in performance brought about by the treatment procedures. The four treatments are also shown to differ significantly when both IQ levels and sexes are combined. The comparisons reveal that both the competition and praise treatments produced performances significantly higher in accuracy than the neutral or reproof treatments. The differences between the competition and praise treatments, and between the neutral and reproof treatments were nonsignificant. The four treatments ranked in accuracy in the descending order of competition, praise, reproof, and neutral. The four treatments ranked in accuracy as follows for the normal Ss: competition, praise, reproof, and neutral. The differences between treatments did not attain significance within the normal group. For the retarded Ss, the same rank order of the treatments in accuracy was found: competition, praise, reproof and neutral. For the retarded Ss, however, the competition and praise treatments were each significantly higher in accuracy than the neutral or reproof treatments.

Conclusions

The analysis of the accuracy data revealed a number of meaningful findings. One such finding is the comparative inferiority of the retarded Ss on the pursuit-rotor task. Such a finding was not expected in the light of the general view that children in the 60 to 85 IQ range are primarily deficient in verbal, rather than in motor skills. The accuracy-treatments main effect is consistent with the earlier findings showing superior performance in a social-reinforcement condition. The fact that the differences between the treatment conditions achieved significance for the retarded Ss but not for the normal Ss indicates a greater relative difference in effectiveness among the four incentive conditions for the retardates. This finding is consistent with earlier studies revealing a greater response to verbal incentives by institutionalized retarded children than by non-institutionalized normal children.

48. Meichenbaum, D., & Goodman, J. The developmental control of operant motor responding by verbal operants. *Journal of Experimental Child Psychology*, 1969, *7*, 553-565.

Rationale

Two general strategies have been employed to assess the influence of self-verbalizations on behavior. The first strategy is characterized by the S's performance on a task and E's subsequent inference as to the presence or absence of mediational processes. In general, the results indicate that with age the tendency to make covert verbal orienting and representational responses increases and that these responses serve to mediate the execution of the task. It is suggested that the overt level responses in younger children have the same effect on learning as do covert responses in older children. The other strategy, which is designed to assess the interaction between verbal and nonverbal behavior, directly manipulates the child's verbalizations and examines resulting changes in motor behavior. The child's verbalizations have been manipulated by E giving the child general instructions or a set, or by manipulating the content of the child's self-instructions. The present study was designed to examine the relative efficacy of the differential modes of delivery of verbalizations in governing nonverbal behavior.

Subjects

The Ss were 54 kindergarten (27 females, 27 males) and 30 first grade children (14 females, 16 males) who were in a public elementary school. The Ss were randomly assigned, equating for sex, to each of the three experimental conditions.

Method

The Ss were divided equally among the following experimental conditions: *Externally administered* condition in which the child finger tapped while the verbal operants were spoken by E; *Overt* condition in which the child finger tapped while the verbal operants were said aloud by the child; *Covert* condition in which the child finger tapped while the verbal operants were said quietly by the child (lip movements).

Results

The results indicated that the mode of delivery of verbalizations is an important variable in the development of verbal control of motor behavior. An interaction between the age of the child and the mode of delivery revealed that: a) kindergarten children's motor performance approximated that of first grade children when self-verbalizations were aloud or overt, but covert self-verbalizaitons had minimal functional control over nonverbal operants; b) first grade children's self-verbalizations had more functional significance when covert rather than overt. First grade children's motor behavior was significantly more responsive to E's external commands than that of kindergarten children. The above relationships were evident for both the verbal operants "faster" and "slower".

Conclusions

These findings suggest that language gains functional significance by means of a developmental sequence: First motor behavior is brought under the control of an adult's or E's overt verbalizations; then under the child's overt self-verbalization and then under a diminished self-verbalization such as talking quietly to oneself as in the present experiment, and finally under the control of implicit self-verbalizations. The results of the present study suggest that for the task employed, the kindergarten children were at the stage where overt self-verbalizations had greater functional control than covert self-verbalizations; whereas first graders passed this stage. Forcing first-grade children to make overt their self-verbalizations resulted in less control of motor behavior. One of the pedagogical implications of the present study is that teaching procedures employed be adaptive to the child's optimal stage of self-verbalization. The present results suggest that younger children be encouraged to self-verbalize aloud and this should gradually faded to implicit speech.

49. Meichenbaum, D., & Goodman, J. Reflection-impulsivity and verbal control of motor behavior. *Child Development*, 1969, *40*, 785-797.

Rationale

The present study brings together two areas of research which investigate the development of language and cognition. It examines conceptual tempo or the reflection-impulsivity dimension which describes a consistent tendency to display slow or fast decision times in problem situations where the S must select one hypothesis from several possibilities. The second area of research arises from a number of investigators' observations that children often talk to themselves and that speech-for-self often seems to serve the function of orienting or directing the child's behavior. Luria and Vygotsky have proposed a developmental sequence by which speech-for-self becomes internalized and directive of one's behavior. According to Luria, the child under two years of age is not able to use speech to direct his own behavior. However, the speech of others can initiate, direct and control the child's behavior but cannot inhibit behavior. During a second stage the child can use his own speech to control his behavior to some extent. It is only in the third stage that the semantic content of the child's speech-for-self becomes dominant, directive and internalized. Several studies support the view that there is a stage of development when verbal behavior does not direct and control nonverbal behavior. The characteristics of the children for whom verbalizaitons do not control motor behavior have not been examined. One of the purposes of the present study was to examine the relationship between the ability to control motor behavior verbally and the reflection-impulsivity dimension. A second purpose of the study was to compare the differential effectiveness of mode of delivery (overt vs. covert) of self-instructions in controlling motor behavior.

Subjects

The Ss were 30 kindergarten children, age range from 63 months to 76 months.

Method

Each child was taken by the E from his classroom to a mobile laboratory where two tasks designed to assess verbal control of motor behavior were administered. Two weeks later each child was tested on the MFF test. In order to assess the effects of the self-verbalization "faster" and "slower" on motor behavior, a finger tapping task was administered. Following the preassessment which indicated that the kindergarten children understood the meaning of the words faster and slower, the finger tapping task was presented. The finger tapper consisted of a metal telegraph key connected to a counter. Each child was required to press the finger tapper for two trials of 15 seconds each with a 15-second rest between trials under the following conditions: a) baseline or operant phase; b) while saying the word "letter" aloud to himself; c) while saying the work "faster" aloud to himself; d) while saying the work "slower" aloud to himself. The "letter" condition was included in order to assess the interference effect of verbalizing on finger tapping speed. The "letter", "faster", and "slower" conditions were readministered while S said the words to himself quietly. The second motor task assessed the degree of verbal control of the words "push" and "don't push" on motor behavior.

Results

The analyses of variance of tapping behavior of reflective versus impulsive children did not yield any significant differences for the letter, faster and slower conditions for either overt or covert self-verbalizations. In other words, the tapping performances of the reflective and impulsive children did not significantly differ from each other under the variety of self-instructional conditions. The impulsive children emitted significantly more self-instructions than the reflective children. This significant difference was evident for both the overt and covert self-instructional conditions. The impulsive child more often used the words as a metronome effect, tapping each time he uttered the word, indicating a greater reliance on the motor component of speech. In comparison, the reflective child used the word as a cue, tapping several times for each self-instruction under the "faster" and "slower" conditions, indicating a greater reliance on the semantic content of his self-instructions. The degree of verbal control of motor behavior on the foot-depression task was related to the dimension of conceptual tempo, this being more evident when the S's speech-for-self was covert than when it was overt. The Luria task revealed that kindergarten children evidenced significantly more verbal control in inhibiting motor behavior when their self-instructions were overt than covert. Kindergarten children inhibit motor behavior more effectively when their self-verbalizations are aloud than to themselves.

Conclusions
The results indicate a relationship between the dimension of conceptual tempo and the ability to control motor behavior verbally. The self-instructions of impulsive children were less directive of their behavior than those of reflective children.

50. Morrison, D., & Pothier, P. Two different remedial motor training programs and the development of mentally retarded pre-schoolers. The American Journal of Mental Deficiency, 1972, 77, 251-258.

Rationale
The main purpose of this study was to compare the effectiveness of a remedial program of sensorimotor training based on individual prescriptions that were derived from an assessment of sensorimotor development, with a remedial program that employed similar training methods without reference to a developmental assessment. This study investigated the effects of a prescribed program of gross-motor activities on retarded development in an experimental design that controlled for the effects of social attention, and reinforcement of the subject for attending to, attempting and performing gross-motor tasks.

Subjects
The subjects were 27 children, who lived at home and attended a nursery school forretarded children. Their IQ andMA scores were not available.

Method
Three groups of nine subjects each were formed: a) the Sensori-Motor training group (S-M), b) Gross-Motor Training Group (G-M), and c) the Attention group. Random assignment of subjects to the three groups was attempted. However, because of various reasons, such as parents withdrawing the child from the nursery school, four children had to be assigned to the G-M training group after the subjects in the other two groups and five subjects in the G-M training group had been randomly assigned. The S-M training group contained six males and three females with an average age of 47.7 months. Retardation in five of these children was due to Down's Syndrome and due to unknown causes in four children. The G-M training group had five males and four females with an average age of 47.1 months. Six were retarded due to Down's Syndrome and four due to unknown causes. The Attention Group also had five males and four females. The average age was 53.3 months. In four children retardation was due to Down's Syndrome and due to unknown causes in the remaining five children. The Denver Developmental Screening Test was individually administered to all the subjects. The DDST is divided into four subsections: Gross Motor Performance, Fine Motor Performance, Language Performance and Personal-Social Skills. The subjects participated in the programs for 20 to 30 minutes daily, 5 days a week for six months.

If a subject demonstrated an ability to benefit from small group activity he was seen in groups of 2 to 4 children. If he was unable to participate in group activity he was seen individually. Attention group: This group provided a control for the effects of close physical contact and attention in any activity he wished to engage in as long as it did not involve social isolation or consistently involve activities similar to those engaged in by the two remaining groups. G-M training group: The experimenter's interaction with this group was limited to a variety of indoor and outdoor gross-motor activities. Activities that would allow for improved performance were selected for each subject. The experimenter encouraged the subjects' participation and provided contingent social reinforcement for attending behavior and subjects' attempts at, and performance of, the activities. S-M training group: Procedures developed by Kephart and others and suitably modified for this age range and population, were followed with the subjects in this group. Prior to beginning the program each child in this group was assessed in terms of his level of sensorimotor development. On the basis of the subject's performance during this assessment an individualized program of sensorimotor training was developed for each subject. The training program included such gross-motor activities as angels-in-the-snow, walking on a mattress, balancing board, obstacle courses, and tutoring sessions in appropriately coordinated rolling, crawling, and walking. Each activity to be trained was analyzed in terms of its simplest component part and the child was then trained on each of these until the total response was acquired.

Results

The results of the Full Scale Score demonstrated a significant effect of pre vs. post test. This effect was due to the greater increment in the DDST performance of the S-M training group over the 6 month interval. The results of the Gross-Motor scores demonstrated a significant effect of pre vs. post test. This effect occurred because of the greater increment in test performance overtime in the S-M training group when compared to the increment over time in the G-M training and Attention group. The results of the Language Score demonstrated a significant effect of pre vs. post test. This effect resulted from the greater increase in scores over the 6 month interval for the S-M training group when compared with the two remaining groups. The results of the Personal-Social Scores demonstrated a significant effect of pre vs. post test.

Conclusions

The comparisons of the relative effectiveness of the three types of intervention used in this study indicate that a suitably modified version of Kephart and Ayre's sensorimotor training procedures for this age range of mentally retarded children results in greater gains in development than do intervention techinques involving either social attention or reinforcement for attending to, attempting, and succeeding at gross-motor activities. More specifically the S-M training group demonstrated significantly greater gain scores in overall development and gross-motor and language development than did the other two groups. The fact that the subjects in the S-M training group were trained to adequately perform separate components of a task as a step toward performing the whole task suggests that they might have experienced more precise reinforcing contingencies, as well as more reinforcement in general, than the subjects in the G-M training group who were not trained in this manner. Such differences in reinforcement procedures between the S-M training and G-M training groups might account in part for the differences between these groups observed in this study. The added growth in language evidenced in the S-M training group indicated that sensorimotor training with its verbal aspects is a remedial language training program. The failure of the S-M training group to demonstrate a significant effect in fine motor development could be explained by Kephart's theory. Kephart states that perceptual motor skills progress from the more gross to finer perceptual motor coordinations. Since the subjects had only six months of sensorimotor training it is possible that no significant change had yet occurred in fine motor skills.

51. O'Connor, C. Effects of selected physical activities upon motor performance, perceptual performance and academic achievement of first graders. Perceptual and Motor Skills, 1969, 29, 703-709.

Rationale

The purpose of the present study was to investigate the effects of a physical activity program suggested by the theories and techniques of Kephart upon motor performance, perceptual performance and academic achievement of first grade boys and girls. The research hypotheses were that the Kephart-type physical activities, when compared with a traditional physical education program, would elicit: 1) greater improvement in performance on motor-ability test items; 2) better performance on perception-oriented items; and 3) improved academic achievement by first graders.

Subjects

Fifty-nine boys and 64 girls randomly assigned to an experimental group and a control group were Ss. The mean chronological age for the experimental and control groups at pretest was 79.9 months and 79.5 months respectively. The mean chronological age for the experimental and control groups at posttest was 85.9 months and 85.5 months respectively.

Method

Complete pretest and posttest motor ability data were collected for 44 experimental and 48 control Ss on the following variables: grip strength, back-and-leg lift strength, Sargent jump, standing broad jump, squat thrust, side-step test, 30-yard dash, 25-foot run-and-sit test, 50-foot hopping test, ball bounce test, items form the Brace and Johnson tests of motor ability, one-foot standing balance time and number of steps to errors 1,2,3,4, and 5 on the 2-inch and 4-inch balance beams. Complete pretest and posttest data were collected on the Perceptual Forms Test, the Metropolitan Readiness Test (pretest) and the Metropolitan Achievement Test (posttest). During the six months between the pretests and posttests, the control Ss received physical education instruction from their classroom teachers. The experimental Ss' treatment was the Kephart-type motor activity program. The program consisted of balance-beam activities, hopping routines, stunts and tumbling, obstacle course activities, tetherball, movement imitation, soccer-type activities, activities emphasizing basic locomotor patterns and oculomotor pursuits.

Results

A significant difference was found between experimental and control groups' mean change on each of the following measures of motor ability: grip strength, squat thrust, side-stepping, run-and-sit, 50-foot hop time on the right and left feet, ball-bounce test, total Brace score, total Johnson socre, standing balance time on the right and left feet with the eyes closed and number of steps to errors 1,2,3 and 4 on the 2-inch balance beam. All significant differences favored the experimental group with the exception of differences in grip strength. Between groups on the Metropolitan Readiness and Achievement Tests no significant difference was found.

Conclusions

The conclusion drawn from this study is that change in gross motor ability elicited by the Kephart-type gross motor activities does not necessarily effect change in perceptual or academic ability of the average first grader. The mediating factors relating motor performance to academic achievement remain elusive in the present study. The conclusions of the present study, however, do not discredit the possible usefulness of the Kephart-oriented physical activity program for improving motor performance of the average first grader. Indeed, the Kephart program appears to have merit for the elementary school physical education curriculum as children did improve.

52. Oliver, J.N. The effects of physical conditioning exercises and activities on the mental characteristics of educationally sub-normal boys. *British Journal of Educational Psychology*, 1958, *28*, 155-165.

Rationale

This study is one of the earliest efforts to empirically examine the effects of a progressive, systematic program of physical conditioning on the physical and mental characteristics of mentally retarded children. Oliver discusses the relationship between physical and academic achievement, level of aspiration and success experiences in mentally retarded boys. Frequent academic failure and rejection in physical activities leads to low levels of aspiration. Based on research indicating that retarded children more closely approach normalcy in *physical* rather than *mental* capacity, Oliver reasons that training and improvement in physical skills would result in feelings of success which would in turn lead to increases in general level of aspiration which would then generalize to performance on standardized tests of mental capacity.

Method

Ss were divided into two groups of 20 each. The experimental and control groups were taken from two separate residential schools for educationally sub-normal children in England. The experimental group was composed of 19 boys from the ages of 13 to 15 and one 12 year old boy. The group mean IQ was 70.1 with a range of 57 to 86. One boy's scores were not included in the data because he achieved an IQ score of 95, placing him within the normal range. The control group was matched with the experimental group "as nearly as possible" for age, intelligence, size and physical condition. A pre-post test format, utilizing a series of physical andmental tests was used. The tests used to measure mental ability were the Terman-Merrill IQ, Goodenough Mental Age, Raven's matrices, Porteus maze and Goddard form board tests. They were administered by the same tester on both test and retest at a six month interval. The physical tests were of motor educability, athletic achievement and physical fitness. The experimental treatment was a 10 week program of physical conditioning consisting of 3 hours/day, 5 days/week of various recreative, strengthening, conditioning and remedial physical activities.

During this period the control group engaged in their regular physical education program of two lessons per week and some organized game playing.

Results

The experimental group made significant gains in the physical areas of athletic achievement, physical fitness and strength. When considering the effects of the treatment upon mental measures, the author found significant gains on the Terman-Merrill IQ, Goodenough and Porteus maze tests. He reports a mean gain of 4.3 IQ points in the E group as opposed to a mean gain of 0.9 for the C group on the Terman-Merrill, with more than 25% of the E group gaining more than 5 points on this test.

Conclusions

In discussing these results Oliver puts forward an explanation in terms of a motivational or self-concept theory stating that as the S's experienced success they became increasingly ego-involved in their activities in general thus resulting in increased levels of aspiration. He views this emotional change as being at the crux of this effect. Due to the lack of inclusion within the study of experimental measures of these concepts in clearly defined operational terms, this discussion is at best speculative. Oliver closes his article by raising the question of the permanence of the gains he has documented and by calling for increasing emphasis on physical education of sub-normal children.

53. Painter, G. The effect of a rhythmic andsensory motor activity program on perceptual motor spatial abilities of kindergarten children. Exceptional Children, 1966, 33, 113-116.

Rationale

The purpose of this study was to investigate the effects of a rhythmic and sensory motor activity program on body image, perceptual motor integration, and psycholinguistic competence of kindergarten children. The following hypotheses were tested: that a systematic program of rhythmic and sensory motor activity will affect the level of ability to draw a human figure; ameliorate the apparent distortion of body image concept; improve visual motor integrity; improve sensory motor spatial performance skills; and improve psycholinguistic abilities.

Subjects

The lower 50% of a normal kindergarten class (as determined by Goodenough MA scores) were placed into two groups matched on IQ, CA, MA, and sex (total N=20).

Method

All Ss were given the ITPA, the Goodenough Draw-a-man Test and the Beery Geometric Form Reproduction (measuring visual motor integrity and requiring copying of designs which systematically progress in difficulty from a simple straight line to complicated figures). SBIQ given prior to training and a sensory motor performance test (designed for this investigation) was given at the conclusion of training. Twenty-one half hour training sessions were given to the experimental group, 3 times/week over seven weeks. Limits on time and space prevented control forHawthorne effect. The program was carefully sequenced, using theoretical constructs suggested by Barsch (1963) and Kephart (1960). Thirty-eight activities were related to 9 of 12 movement areas of Barsch's Movegenic Theory. The areas are: visual and auditory dynamics (Simon Says and pantomime), dynamic balance, spatial awareness, tactual dynamics (haptics), body awareness (identification of body parts), rhythm, flexibility (tempo change), and unilateral and bilateral movement. Additional areas of Kephart's theory were incorporated into the activities. Gross and fine motor activities were presented in each of the areas systematically sequenced to progress from the very simple to the more intricate as the children developed in skill.

Results

All the hypotheses were supported at statistically significant levels. The strongest comparative gains were on the ITPA Motor Encoding subscale.

Conclusions

A carefully designed program of rhythmic and sensory motor experiences can bring about significant gains in body image, perceptual motor integration, and psycholinguistic competence in below average kindergarten children. It is noted that the small sample limits the generalizability of the results but no mention is made of the possible effects of regression to the mean and Hawthorne Effect on the results.

54. Paloutzian, R.F. Promotion of positive social interaction in severely retarded young children. American Journal of Mental Deficiency, 1971, 75, 519-524.

Rationale

The evidence is clear that if a child does not possess imitative ability, then imitation may be treated as a response class and shaped into his behavioral repertoire through the use of prompting and reinforcement in a fashion similar to other behaviors. Once this is accomplished, the subject's imitative repertoire can be expanded to include other behaviors, including positive social behaviors. The present study was designed to demonstrate the potential use of prompting and reinforcement in promoting positive social interaction among severely retarded young children.

Subjects

Twenty severely retarded children were selected.

Method

Ss were matched on the basis of chronological age, developmental age, and developmental quotient, and were randomly assigned either to the experimental or control group. The experimental subjects were given imitation training; the control subjects received no special imitation training and were involved in their usual ward activities during the training sessions for the training sessions for the experimental subjects. Imitative behavior, as tested by a series of simple motor responses, was initially absent in all subjects. Prior to training, all the subjects were rated on a Social Interaction Rating Scale developed by the authors. The Social Interaction Rating Scale is an eight-point scale to measure the level of social behavior of young retarded children in a free-play setting. The subjects were observed by two raters during daily scheduled free-play periods. Twenty such ratings were made per day for three consecutive days, resulting in a total of 60 baseline ratings per subject.

After the experimental subjects had received training, the subjects were again rated by a different rater and assigned a score, thus making possible a pretest posttest comparison. The procedures used for training the experimental subjects to imitate were adapted from those used by Baer. The first training session was designed to adapt the subject to the experimental situation and to strengthen the reinforcing properties of the experimenter's verbal behavior. Hence, the subject was given spoonfuls of ice cream noncontingently. Imitation training began with the second session. The experimenter said "Do this" to the subject, simultaneously raising one arm over his head. Immediately following this demonstration, the experimenter reached across the table with his free hand and physically raised the subject's arm. The moment the subject's arm was raised, the experimenter said "Good boy (girl)", and followed the "response" with a spoonful of ice cream. Physical prompting of responses was gradually faded out until the response was made upon verbal prompt and demonstration alone. Each experimental subject received 25 motor response imitation training sessions of 25 trials each before proceeding to the social interaction phase of training. During the social interaction phase of training, two models and two subjects were used for each session. The general procedure for training a subject consisted of one adult model performing the response in front of the first subject being trained. The response was performed upon a second subject who served as an object for the purposes of demonstration. The model said "Do this" the the S being trained each time he demonstrated the response. The subject being trained imitated the procedure or was physically prompted if necessary, and the positive reinforcement (ice cream and social attention) was delivered. The social interaction responses used in this phase of training were passing a bean bag, walking to another subject and gently stroking his face, pulling a peer in a wagon, pushing another child in a swing, and rocking another child in a rocking chair or hobby horse. Each subject required only 10 training sessions to complete this phase of training.

Results

The Social Interaction Rating Scale scores were first subjected to a two-factor (Groups X Occasions) analysis of variance with repeated measures on the second factor. The significant interaction indicated that the change from pretest to posttest differed for the two groups. This analysis showed that a) a significant change from pretest to posttest occurred only for the experimental group, and b) a significant difference between the means of the two groups occurred only on the posttest.

Conclusions

A major finding of this study is that it is possible to elicit positive social behaviors from severely retarded young children so that they can be subsequently reinforced. The successful acquisition of such behaviors by children who initially showed little or no imitative behavior is an achievement, and demonstrates the potential therapeutic utility of the imitation training techniques used in this study. In addition to training retardates to interact socially, prompting and reinforcement might be used to train dressing behavior, speech, or more complex specific tasks - behaviors which are usually lacking in cases of severe or profound retardation.

55. Pryzwansky, W.B. Effects of perceptual-motor training and manuscript writing on reading readiness skills in kindergarten. *Journal of Educational Psychology*, 1972, *63*, 110-115.

Rationale

The purpose of this study was to investigate the effects of various perceptual motor training programs and manuscript training on kindergarten children's test scores in the area of reading readiness. Two hypotheses were posed: a) perceptual training programs emphasizing fine-motor exercises, including manuscript training, assist kindergarten children in making higher scores on tests of readiness skills and work discrimination ability compared to pupils who do not receive such training; and b) learning to reproduce letters of the alphabet is expected to produce greater gains among kindergarten children's readiness skills test scores, as well as word discrimination ability, than either fine-motor programs or similar type activities included in a regular kindergarten curriculum.

Subjects

Kindergarten children in 6 schools (N=559) were tested.

Method

Three commercially available perceptual training programs were selected for study: a) Template Training; b) the Frostig Development Book of Visual Perception, Intermediate Level; and c) Peterson Handwriting System. All three perceptual programs emphasize the development of fine-motor skills required in paper-and-pencil tasks. The fine-motor training lasted 13 weeks; 15 minutes per day were devoted to exercises. The Gates-MacGinitie Readiness Skills Test was administered (in two parts, as outlined in the manual) 1 week prior to the commencement of the study and during the week that followed the completion of training. The Gates-MacGinitie test consists of eight subtests: Listening Comprehension, Auditory Discrimination, Visual Discrimination, Following Directions, Letter Recognition, Visual Motor Coordination, Auditory Blending, and Word Recognition. Analysis of covariance wasused to evaluate the Gates-MacGinitie mean readiness posttest results to allow for adjustments of differences obtained during pretesting. In order to evaluate the effect of perceptual training on the word discrimination ability of kindergarten children, two tests were administered during the posttest sessions.

Results

The analysis of covariance statistical procedure was used to determine if any difference existed among the Gates-MacGinitie adjusted posttest means. A significant *F* ratio was obtained. The improvement shown by all pupils exposed to all three perceptual-motor training programs was not statistically significant when compared to the scores achieved by children in the control kindergarten programs. The improvement shown by the children in the manuscript program was found to be significant when compared to the mean score for children receiving the other two perceptual motor training exercises.

Conclusions

The present finding that the inclusion of these three perceptual motor programs into the kindergarten curriculum did not significantly affect readiness skills as measured by the Gates-MacGinitie test, is somewhat compatible with the results of previous studies. The hypothesized advantages of perceptual motor activities were not demonstrated by this study, and the results of this study coupled with the finding noted in the literature, then, would seem to raise serious reservations regarding the adoption of such training into the curriculum. Most of the children included in this study apparently came to school with adequate perceptual motor skills; that training, therefore, was not appropriate.

56. Rarick, G.L., Widdop, J.H., & Broadhead, G.D. The physical fitness and motor performances of educable mentally retarded children. Exceptional Children, 1970, 36, 7, 509-519.

Rationale

Numerous investigations have shown that educable as well as trainable mentally retarded children lag behind children of normal intelligence in the development of gross motor skills. While the results of these studies are in general agreement, the testing procedures have varied markedly from one investigation to another and each has embodied a relatively small sample of children within a limited geographical area. The present investigation was designed to obtain data on the motor performance of a national sample of educable mentally retarded children and to compare their performance by age and sex with national standards on boys and girls of normal intelligence. A second purpose was to establish norms of motor performance by age and sex suitable for use with educable retarded children. The rationale for the present investigation is based on the following premises: a) that motor performance standards established on normal children are not suitable foruse with the educable retarded; b) that motor skill development and maintenance of reasonable levels of physical fitness are as important for the mentally retarded as for boys and girls of normal intelligence; and c) that the establishment of appropriate national standards will motivate the schools to improve programs of physical education for the retarded and will provide realistic goals for these children.

Subjects

The sample was drawn from thepopulation of educable mentally retarded children, 8 to 18 years of age inclusive, in the public schools of the continental United States during the 1966 calendar year. The definition of "educable mental retardate" used by the local school district was followed. In almost all instances, children within an IQ range of 50 to 80 were included. Usable data were obtained from 4,235 children representing 241 separate schools in 21 states.

Method

The AAHPER Youth Fitness Test (American Association for Health, Physical Education and Recreation, 1958), appropriately modified for use with educable mentally retarded children, was selected as the test battery most suitable to assess the motor performance of these children. The test is made up of seven test items designed to assess such components of gross motor performance as muscular strength, speed of movement, agility, coordination, and endurance. The seven items are a) the flexed arm hang for girls and pullups for boys, b) situps, c) standing broad jump, d) shuttle run, e) 50-yard dash, f) softball throw, and g) 600 yard run-walk. Prior to initiating the testing program, three of the AAHPER Youth Fitness Test items were modified slightly.

Results

Age changes in performance followed essentially the same trends as in normal children, although the retarded of both sexes were substantially behind standards on normal children. Sex differences in performance of the retarded were similar to those noted in normal children, the boys showing superiority in all tests at all ages. Intercorrelations among the test items were low for both sexes at all age levels and of approximately the same magnitude as in the children of normal intelligence.

Conclusions

Performance standards for normal children are clearly not appropriate for use with the educable retarded. The investigators present a procedure whereby present status and development can be plotted for each child, using as referents standards resulting from the present investigation.

57. Rarick, G. L., & Broadhead, G.D. *The effects of individualized versus group oriented physical education programs on selected parameters of the development of educable mentally retarded, and minimally brain injured children*. Monograph sponsored by the U.S. Office of Education and the Joseph P. Kennedy Jr. Foundation, 1968.

Rationale

This investigation was designed to determine the role of educational physical activity programs in the modification of the motor, intellectual, social, and emotional behavior of educable mentally retarded children and minimally brain injured children of elementary school age. Of the four treatments, two involved special educational physical activity programs, the one being individually oriented, the other group oriented. A third treatment was an art program, included to assess the Hawthorne effect. The fourth treatment served as an experimental control.

Subjects

Forty-none classes of educable mentally retarded children (N=275), and minimally brain injured children (N=200), participated in twenty weeks of instructtional programs. Classes were randomly assigned by disability and age to one of four treatments.

Methods

All programs were taught by the classroom teacher for approximately thirty-five minutes every school day for a period of twenty weeks. The teachers were prepared for the teaching and testing programs through in-service meetings. The research was supervised throughout by the project assistant, a fully qualified physical educator. A total of 32 tests, selected to measure the four parameters of behavior, was administered to the children prior to and at the conclusion of the experiment. The treatment of the data was by multivariate analysis of covariance.

Results/Conclusions

1. Children who participated in one of the three specially planned experimental programs were subject to significantly greater positive changes in their motor, intellectual, and emotional behavior, than children who were denied the opportunity.
2. Of the specially planned experimental programs the physical education programs proved to be superior in modifying motor performance, the art program was superior in modifying the emotional behavior of the younger children, and the programs played an equal role in modifying the intellectual behavior of the children.
3. The physical education program which was oriented towards the individual rather than the group was more successful in eliciting changes in the motor, intellectual, and emotional parameters of behavior of the children.
4. Positive changes in behavior occurred more frequently in the older than the younger children, more often in the minimally brain injured than the retarded children, and appeared more likely to occur in the boys than the girls.

58. Reitan, R.M. Sensorimotor functions in brain-damaged and normal children of early school age. Perceptual and Motor Skills, 1971, 33, 655-664.

Rationale

The present investigation was concerned with an evaluation of a number of motor, psychomotor, and tactile perceptual functions. Several hypotheses were formulated with respect to comparison of groups. It was postulated that normal Ss would perform more rapidly or with fewer errors on tests of both motor functions and of tactile-perceptual functions using the preferred hand. Secondly, normal Ss also would do better with the non-preferred hand. Finally, the difference between the preferred and non-preferred hand would be less for normal than for brain-damaged Ss. This hypothesis was based on the observation that brain damage, if present, might very well involve this one cerebral hemisphere more than the other. If a systematic factor of this type contributed to determination of handedness, it was likely that the non-preferred hand of any S might have been especially impaired as a result of brain damage. Consequently the difference between the two hands would be greater than for normal Ss. Difference scores between the two hands were expected to be deviant for the brain-damaged Ss, in many instances with the non-preferred hand performing quite poorly with relation to the preferred hand.

Subjects

Two groups of children ranging from 5 through 8 years of age were composed. Each group consisted of 11 males and 18 females, matched in pairs for sex and chronological age. The brain-damaged group was composed only of Ss in whom definitive evidence of cerebral damage was present.

Method

Measures of motor functions included finger-tapping speed, strength of grip, motor coordination (Marching Test), and psychomotor problem-solving (Tactual Performance Test). The Marching Test is a measure of coordinated function of the upper extremities. Th Tactual Performance Test measures psychomotor skill in a problem-solving context. An additional procedure on which the groups were compared related to name writing speed.

Results
Adequacy of motor functions consistently differentiated the two groups. Finger-tapping speed with both the preferred and non-preferred hands was definitely slower in the brain-damaged group. Considering the results on measures of motor functions more generally, it is interesting to note that the largest *t* ratios were usually obtained in comparing the non-preferred handin the two groups. It is apparent that the brain-damaged subjects required nearly twice as much time to write their names (either with the preferred or non-preferred hands) than did the normal Ss.

Conclusions
The results of this study confirmed the hypotheseswith respect to differential performances of motor and tactile-perceptual functions in groups of children with and without cerebral lesions. The brain-damaged group performed more poorly with the preferred as well as the non-preferred hand on motor functions that required speed, strength, coordination, and problem-solving skills. Based on differences between the preferred and non-preferred hands of the controls as a reference, the brain-damaged Ss rather consistently performed more poorly with the non-preferred than with the preferred hand. The present findings suggest that, at least in young children, differential results between the two hands may very likely result from the fact that brain damage is a systematic factor which contributes to development of handedness. The results, generally considered, suggest that70% to 80% of Ss in the present study were classified correctly to their appropriate groups on the basis of the dependent variables. If confirmation of these percentages is obtained in cross-validation studies, it appears that evaluation of motor and tactile-perceptual functions may contribute to available diagnostic procedures for identifying brain-damaged children.

59. Rieber, M.U. Mediational aids and motor skill learning in children. *Child Development*, 1968, *39*, 559-567.

Rationale
Learning has traditionally been regarded as an incremental process in which the tendency to make the correct response gradually increases with practice. A number of recent reports on learning in adults as well as children have tended to contradict this assumption. Studies of discrimination learning in children report that acquisition takes place in a sudden or all-or-none fashion. Very little is known about the acquisition of simple motor skills in children, since most of the available studies have been concerned with changes related to age rather than practice. However, from the information that is available, it seems reasonable to assume thatmotor skills, unlike discrimination learning and concept formation, are acquired gradually as an increasing function of the amount of practice. One factor which might distinguish between those tasks that are learned gradually and those acquired suddenly is whether S made use of mediational processes during learning. Ordinarily, motor skills cannot be learned by simply discovering the appropriate mediators. While it is apparent that mediation can play some role in the learning of a motor skill, particularly through instructions to S, there remains an important nonmediational component in the learning process.

Subjects

The Ss for this experiment were 192 children: 60 kindergarteners, with an average age of 5 years, 8 months; 66 second graders with an average age of 7 years, 9 months, and 66 fourth graders with an average age of 9 years, 11 months.

Method

In order to examine the question of whether the learning of a simple motor task is gradual or sudden, children were tested on an apparatus similar to a pinball machine. The Ss were required to adjust a spring-loaded plunger so that when released it would apply just enough force to push a steel ball into a target hole. By the addition of a pointer and scale to the plunger, it was possible to convert the task into one which could be learned by discovering the appropriate pointer setting and using this information to mediate positioning of the plunger. If mediation is one of the variables determining the discontinuity of the learning processes, then Ss who had the pointer available and utilized it should show sudden learning, while the others should learn gradually. The experimental design called for three cue conditions which differed in the type and amount of cues available to S while he was setting the plunger. Under the No Cover (NC) condition, the apparatus was fully exposed to S, and he could rely on kinesthetic cues resulting from the action of his hand on the plunger as well as two types of visual cues. In the second or Small Cover (SC) condition, a 2X4-inch cover was placed over the plunger mechanism, effectively concealing the pointer and scale from S's view. Under this condition, S relied only on general visual cues and/or kinesthetic feedback. In the third or Large Cover (LC) condition, a cover measuring 8X12-inches was placed over the plunger. This served to eliminate any visual cues emanating from the pointer, plunger, or position of S's hand. Under this condition, it was assumed that S relied solely on kinesthetic cues in positioning the plunger.

Results

Thepercentage of Ss achieving criterion increased significantly with age. There was an overall significant difference among the three conditions in terms of the percentage of Ss who learned. Separate analysis revealed that a reliably greater number of Ss learned under NC than under SC or LC. It appears that the distribution for the NC learners is composed of two distributions, one consisting of Ss who made use of the pointer scale and learned early, and the other containing those Ss who did not utilize the pointer and scale but learned in a manner similar to SC and LC Ss.

Conclusions

The data indicated that a simple motor skills task, of the type employed in the SC and LC conditions, was learned in a gradual manner. The number of correct responses emitted by S increases with practice for both learners and nonlearners. However, if the motor task is modified so as to provide cues which can be used by S to make a mediating response, then some Ss show sudden acquisition. It appears that one of the variables affecting the continuity of learning is the availability and utilization of cues which can enter into a mediational chain. These cues were available in the NC condition. If early learning is regarded as an indication of whether these cues were utilized, then none of the kindergarteners, 17 percent of the second graders, and 45 percent of the fourth graders used them to mediate their plunger-adjusting responses. This increase with age is consistent with the literature on the use of mediating responses by young children.

Ross, D. Incidental learning of number concepts in small group games.
60 American Journal of Mental Deficiency, 1970, 74, 718-725.

Rationale
Ross reasons that social play and games represent important sources of direct and incidental learning for all children. This may be especially true for EMR children due to the attention-directing and motivational qualities of the game experience. EMR children undergo "social play deprivation" and failure experience as a result of the heavy social and intellectual skill requirements in everyday play situations. If EMR children could be trained to proficiency in general game skills they would then be able to profit from the direct and incidental learning implicit and/or explicit in play situations. Ross hypothesizes that EMR children trained in game skills would increase their ability to participate in game learning situations. Further, children trained in game skills would show greater learning of number concepts when taught in game formats than children taught those number concepts through traditional instructional formats.

Subjects
Ss were 40 EMR children (21 males and 19 females, CA 53-119 months, SBIQ 51-79, mean = 66.23).

Method
Children were randomly assigned to E and C groups matched for CA, IQ, MA, and scores on the Number Knowledge Test. (Rote and rational counting, 1:1 correspondence, quantitative terms, telling time, counting money) and the General Game Skills Test (level of skill at playing small group games). E group received 100 minutes/week of small group games (table search games, card games, guessing games, board games, and active racing games). Game controller could control game outcome and no one was allowed to lose too often. Number concepts were introduced incidentally within the game context with no direct number instruction. Children were reinforced for winning. C group received identical number content in regular classroom curriculum but were taken out of classroom 100 minutes/week for small group activities to control for Hawthorne Effect.

Results
The results provided strong support for theGame Training Program in improving Ss' knowledge of number concepts. E group showed significantly higher posttest scores than the C group on all subtests of Number Knowledge Test and on the Game Skills Test.

Conclusions
It is possible to train young EMR children to participate skillfully in small group games and to simultaneously bring about incidental academic learning as a result of participation in the games. Ross suggests transfer of the game playing skills to new settings as indicated by parent and teacher reports.

61. Ross, S.A. Effects of an intensive motor skills training program on young educable mentally retarded children. *American Journal of Mental Deficiency*, 1969, *73*, 920-926.

Rationale

Both the deficiency in the mentally retarded child's motor skills when compared with those of the normal child and the improvement of these skills through various programs of physical training have been documented in numerous studies. E notes that these research efforts largely have used samples drawn from populations of adolescents or young adults. The training programs also have not attempted to incorporate nonmotor social adjustment components of general game skills necessary for EMR children to successfully engage in play with other children. The experimenter feels that the effectiveness of motor skills training programs would be increased by beginning these efforts with young EMR children and by teaching motor skills in conjunction with social components of sports skills, and incorporates these principles into the training program for this study. E hypothesizes that the motor skills of EMR children in this training program would show more improvement than those of a comparable group of EMR children who remain in their usual special class physical education program.

Subjects

Two groups of EMR children of 20 each and one group of 20 normal children were used for the study. The normal group was used only to serve as a point of comparison for the E group gains. The EMR Ss were randomly assigned by class group to either the experimental or control condition. The Ss in the E group had a mean CA of 92.5 months (range of 53-121), mean MA of 62.75 months and mean IQ of 68.40 (range of 48-79). The C group had a mean CA of 90.10 months (range of 49-115), mean MA of 59.80 and mean IQ of 66.25 (range of 51-79).

Method

All three groups were pre and post tested on the Basic Skills Test and the Brace Items Test individually. The Basic Skills Test measures skills which are components of common games and sports, while the Brace Items Test, a selection of items from the complete Brace Scale, purports to measure only general motor abilities. The E group then engaged in a 6-month training period of three 20-25 minute sessions per week while the C group continued its standard special physical education classes. E considers the training program to have nine facilitating principles: 1) simplicity of verbal instruction and frequent use of demonstration; 2) use of games rather than drills for skill practice; 3) use of simple games to teach aspects of standard games; 4) changing rules of play from session to session; 5) active S participation during entire session; 6) short periods and frequent changes of activity; 7) practice in leadership; 8) frequent presence of an adult model to facilitate skill corrections without direct criticism of S; and 9) the close approximation of skill activities to normal children's games. Since the E group met in training sessions containing a maximum of four, the C group spent an equal amount of time out of the classroom in groups of four.

Results

An incidental finding of the study was that the scores of both EMR groups were far below those of the average group on the pretest which supports previous research. The results of the study strongly indicate support for the experimental hypothesis that the basic motor skills used in playing games and sports improve with training. The E group made considerable gains between pre and post test measures on both tests. This group showed especially significant gains on the Basic Skills Test, whereas the C group showed no significant gain on either measure. E group's improvement on the Basic Skills Test raised the group's posttest mean score so that it did not differ statistically from the normal group's mean score on the test.

62. Sechrest, L. Exercise as an operant response for retarded children. The Journal of Special Education, 1968, 2, 311-317.

Rationale

The principle aim of the present investigation, which concerns mentally retarded children, was to determine whether a high energy level work response, exercising on a cycling machine, constitutes an operant response and whether it can be controlled and maintained over a long period of time by one or more simple reinforcements. A general aim of the investigation was to point to the possibility of bringing under external control a rather complex and important response not likely to have a high pre-operant level in the group being studied.

Subjects

The classroom contained seven boys and one girl about 10 to 19 years of age, ranging from moderately to severely retarded. Four of the children were mongoloids.

Method

The equipment developed for this investigation is a standard stationary bicycle. As the child pedals, depending upon how the apparatus has been programmed, various things begin to happen. There may appear on the screen a picture that presumably would be of interest to the child; or, with an audible mechanical arrangement, a small plastic trinket or a piece of candy might slide down into the tray. When the machine was turned on, the discriminant stimulus, i.e., a green light at the upper right hand corner of the panel facing the rider was on. When the machine was not paying off, the green light was off. The exercise machine was set up on one side of the classroom, and the children were permitted to ride it whenever no organized classroom activity was being conducted.

Results

The data consisted simply of daily readings of the number of pedal turns accomplished for the discriminant stimulus on, discriminant stimulus off conditions. There was only one day of the 14 on which the children pedaled more while the SD light was off than on. On nearly all of the other days the margin in favor of the reinforcement conditions was considerable. Both M&M candies and small plastic trinkets were tried as reinforcements along with projected pictures. On the whole, the children seemed less interested in the candy and trinkets than in the slides. There appeared to be some satiation of interest in the pictures, but interest could be restored by using a new set of pictures.

Conclusions

There would seem to be little doubt that the exercycle accomplished at least part of its purpose in sustaining a pattern of exercise, for there was a clear and consistent difference in the use of the cycle during the reinforcing and non-reinforcing periods. There is no way of knowing for certain whether the children were really sensitive to the SD condition, for their pattern of responding could be attributed to trial-and-error testing of the reinforcing propensities of the machine.

63. Semmel, M.I. Arousal theory and vigilance behavior of educable mentally retarded and average children. American Journal of Mental Deficiency, 1965, 70, 38-47.

Rationale

Hebb and others indicate that the cue functionof stimuli cannot exist without a foundation of arousal. Thus, behavioral efficiency is dependent upon the maintenance of an appropriate level of nonspecific activation of the organism. Studies of human vigilance have generally revealed a decrement in the detection of visual or auditory signals as a function of protracted performance under relatively monotonous sensory conditions. The vigilance decrement seems most parsimoniously explained by a "decaying arousal" interpretation. Deductions from the major propositions of the arousal model predicted that EMR Ss, when compared to equal CA average children, would demonstrate relatively poorer signal detection performance throughout the course of a one-hour visual vigilance watch, and that retarded Ss would reveal an earlier andmore rapid decrement in performance efficiency as a function of the amount of time on the task under relatively monotonous stimulus conditions. It was further hypothesized that introducing rest and/or novel sensory stimulation following a protracted period of visual watch would produce significant increments in detection performance for both EMR and average groups, but that the EMR group would reveal a relatively greater increment as a function of induced environmental variation.

Subjects

The Ss were 42 children with average intelligence and 42 EMR children. All EMR Ss had IQs between 50 and 75 and revealed demonstrable academic retardation in their classroom performance. Children were eligible for the average sample if they had an IQ between 95 and 125 and performed at their approximate grade levels. The Ss from both groups were drawn from a CA range between 8 and 15 years.

Method

Each group was randomly divided into two subgroups of 21 Ss each. The four resulting subgroups were designated: Retarded-Rest-Novelty; Retarded-Novelty; Average-Rest-~~Novelty;~~ and Average-Novelty. The S's visual display consisted of a panel, painted flat black. A light bulb was housed in the center of the panel. The signal was a .5 second interruption of the light produced by the signal source. A loud speaker delivered a constant source of white noise which masked extraneous sound and provided a uniform auditory environment during the experiment. The S's response assembly consisted of a silent response button mounted on the surface of a typical school armchair.

Results
EMR group detection means were significantly lower than the average group means during each temporal period. Both groups revealed significant decrements in detection performance as a function of time on watch. As predicted, the results indicated that: a) EMR children received significantly lower total vigilance scores when compared to equal CA average Ss; b) EMR Ss were inferior to average Ss in signal detection abilities (vigilance) at each successive temporal period during the course of the vigilance watch; and c) EMR Ss revealed an earlier and more rapid decrement in vigilance behavior when compared to the equal CA average Ss.

Conclusions
Since the vigilance task required sustained alertness to changes in the signal source, the differences observed between the two groups possibly reflect differential patterns of arousal characterized by a relatively rapid sensory habituation process among retarded Ss. The results suggest thatEMR children undergo a relatively rapid decay in alertness under conditions of reduced sensory variation in the environment. The greatest loss of behavioral efficiency may be expected within the first 20 minutes of an EMR child's performance. Under the same conditions, however, average peers can be expected to maintain a relatively high degree of behavioral efficiency during the first 40 to 50 minutes of a simple vigilance task. The old dictum, "dull minds for dull jobs" is not supported by the results of this experiment. On the contrary, retarded children when compared to their average peers, apparently suffer more from dull, monotonous environments where the maintenance of alert behavior is required. The arousal model led to the prediction that interpolated rest and/or novelty would offset the sensory habituation process through increasing sensory variation; thus increasing decayed arousal levels and vigilance performance. It further suggested that EMR Ss would benefit relatively more than average Ss from such induced sensory variation. The results did not support these hypotheses.

64. Sengstock, W.L. Physical fitness of mentally retarded boys. The Research Quarterly, 1964, 37, 113-120.

Rationale
The purpose of this investigation was to see if EMR boys differed from intellectually normal boys of comparable CA and intellectually normal boys of comparable MA in the performance of tests of physical fitness. There were two general hypotheses proposed in this study: 1) the physical fitness of an EMR group of boys is significantly different from the physical fitness of a group of intellectually normal boys of comparable CA; 2) the physical fitness of an EMR group of boys is not significantly different from the physical fitness of a group of intellectually normal boys of comparable MA.

Subjects

Three groups of 30 boys each were selected for this study. These groups were designated as Educable Mentally Retarded (EMR), Old Normal (ON), and Young Normal (YN) groups. The EMR and the ON groups were equated on the variable of CA, and the EMR and YN groups were equated on the variable of MA. The EMR boys met the additional criteria of: CA within the range of 120-180 months, MA within the range of 72-144 months, WISC full scale intelligence test quotients within the range of 60-80. The ON group of subjects met the following criteria: CA within the range of 120-180 months, MA within the range of 108-198 months, WISC full scale intelligence test quotients within the range of 90-110. The group of YN subjects met the following criteria: CA within the range of 60-160 months, MA within the range of 72-144 months, WISC intelligence quotients within the range of 90-110.

Method

The AAHPER Youth Fitness Test battery was selected as the instrument to measure physical fitness in this study. It measures speed, strength, coordination, and endurance. The individual tests of the battery are: pull-ups, sit-ups, shuttle-run, standing broad jump, 50-yard dash, softball throw for distance, and 600-yard run-walk.

Results

Statistical analysis of the raw scores supported hypothesis 1 in all of the tests. The findings of the present study supported hypothesis 2 in two of the seven tests. The performances of the EMR group were significantly superior to the performances of theYN group in all but the pull-ups and sit-ups tests.

Conclusions

The ON group of boys was significantly superior to the EMR group of boys on all of the seven tests of physical fitness. The EMR group was significantly superior to the YN group of boys on five of the tests. Overall, the EMR group performance was almost midway between the mean performances of the ON and YN groups of boys. The implication is that the policy of placing EMR boys with their CA peers for physical education is open to serious questionif the assumption underlying the program is that the two groups' motor performance is comparable. There might be many activities in a physical education program where the two groups could be integrated with desirable results. Such activities might include calisthenics, simple games, or dancing. However, when games are too complex or contests are run in which competition is keen, the retarded as a group may be unable to perform at the required or normal level. The integration of mentally retarded boys with normal boys of the same CA is recommended on an individual basis where those retarded who are selected for integration are able to perform motor skills at a level comparable to the group with which they are integrated.

65. Shotick, A., & Thate, C. Reactions of a group of educable mentally handicapped children to a program of physical education. *Exceptional Children*, 1960, *26*, 248-252.

Rationale

The purpose of this study was to provide a preliminary investigation into the responses of EMR children to a program of physical education. The responses of the children were categorized into three areas: the level of enthusiasm for each activity; the response to instruction (the degree to which individuals could follow instructions for a given activity), and the response of the children to one another and their interaction during the activities.

Subjects

Ss were seven of the eight children in an intermediate class for EMR children. Ss ranged in age from 10-14 years.

Method

A special program of physical education was initiated for the class of EMR children. Five categories of activities for participation were selected: games of low organization, fundamental skills, stunts and tumbling, swimming and rhythmic activities. The children participated in one of these categories each day of the week except Friday. For three months observers recorded anecdotally the children's performances and reactions during the physical education program. From these observations, patterns of reaction or behavior were determined and a check list was devised in order to objectively rate each child with reference to the categories chosen: Response to Instruction, Enthusiasm and Interaction with Other Children. For the next four months responses were recorded on the check list for all activities except swimming.

Results

All the games of low organization rated moderate to high in "Enthusiasm" and all but volleyball rated moderate to high in "Response to Instruction." All the activities in "Fundamental Skills" rated moderate to high in "Enthusiasm" and in "Response to Instruction" with marching, hanging and walking with hands on a suspended ladder and calisthenics lowest in both areas. All of the activities in stunts and tumbling rated very high in "Enthusiasm" and all but balancing activities rated very high in "Response to Instruction." In the daily program, reaction to other children in the classes was on the whole, positive.

Conclusions

This group of children, ranging in age from 10 to 15 years, participated best in activities generally used with younger children. For developing a program of physical education for EMR children the following might be considered pertinent areas for consideration: Begin with simple activities generally competitive in nature, such as relays, dodgeball, tag games, simple stunts and tumbling activities, and progress to more difficult activities with the readiness of the group. Emphasize activities that hold the children's enthusiasm. Do not allow unsuccessful attempts to teach rhythmic activities to deter the continuance of a rhythmic program. The further the children go in this area, the greater is their enjoyment. Some skill activities such as stunts and tumbling require the actual manipulation of the child's body by the instructor through the given sequence before realization of the skill is possible. When including games in the physical education program, plan for more than one activity during a period. The need forexplanation and demonstration of rules and play situation cannot be over-emphasized.

66. Smith, J.R., & Hurst, J.G. The relationship of motor abilities and peer acceptance of mentally retarded children. The American Journal of Mental Deficiency, 1961, 66, 81-85.

Rationale

The purpose of this study was to investigate the relationship between motor skill and social status in a group of mentally retarded children. Motor skill is here defined as the S's performance on the Lincoln-Oseretsky Motor Development Scale. Social status in this study is limited to peer acceptance; defined as the number of peer contacts, verbal or nonverbal, initiated or received, as measured by a direct observation technique.

Subjects

The sample of Ss consisted of 18 trainables and 25 educables. The mean CA of the trainables was 11-6 with a range from 8-1 to 14-1. Their IQ range on the S-B, form L, was from 33 to 51. The mean CA of the educables was 9-11 with a range from 6-6 to 12-0. Their IQ rnage on the S-B, form L, was 51 to 77.

Method

All Ss were individually administered the Sloan adaptation of the original Oseretsky Motor Development Scale. The scale contains 36 items measuring skills such as finger dexterity, balance, eye-hand coordination, etc., involving both unilateral and bilateral skills designed for use with boys and girls between the ages of six and fourteen. Ss were observed during an unstructured play period and their contacts with the other children were recorded (twenty, two-minute observations of each child). Peer acceptance was defined as the number of peer contacts, verbal or nonverbal, initiated or received. The analysis consisted of six multiple-correlation and multiple-regression problems. The same predictors (independent variables) were used in each regression problem, namely CA, MA and OS (Oseretsky Score).

Results

The three predictors (independent variables), CA, MA, and OS, yielded significant multiple correlations with each of the criterion variables. The most revelant findings concerning the relationships being studied can be found in the Beta coefficients for the linear regression of each criterion (dependent) variable in turn on each of the predictor (independent) variables, with the other predictor variables held constant. The Oseretsky scores of both groups of retarded Ss, with CA and MA held constant were significantly related to the total child contacts (TC). The Beta coefficient for the educable group was .84± .12 accounting for approximately 76 percent of the variance of TC. The Oseretsky scores of both groups of retarded Ss, with CA and MA held constant were significantly related to verbal contacts (V). The Oseretsky scores of both groups of retarded Ss, with CA and MA held constant, were significantly related to non-verbal contacts (NV).

Conclusions

The results of this study and their relative consistency in the two groups of Ss support the hypothesis that motor ability, as defined in this study, plays a significant role in peer acceptance, as defined, for these children. It is interesting to note that motor ability (OS) was consistently superior relative to CA and MA as a predictor of the criteria.

67. Solkoff, N., Todd, G.A., & Screven, C.G. Effects of frustration on perceptual-motor performance. Child Development, 1964, 569-575.

Rationale

Evidence to date, although not entirely consistent, suggests that perceptual-motor performance, problem-solving behavior, and constructiveness are adversely affected when immediately preceded by frustration. In the present experiment, a coding subtest, rather than constructiveness of play was used to study the effects of frustration. It has been suggested that the lowered play constructiveness may have resulted from an increase in competing responses generated by the frustration, thereby reducing the amount of time actually spent at post-frustration play. Although the coding subtest and play constructiveness are far from being comparable, it is possible to study changes in perceptual-motor performance as a function of frustration-produced competing responses.

Subjects

Ss were 42 boys and 42 girls with an age range of from 5 years to 9 years, 11 months.

Method

The apparatus consisted of a "booth-like" marble dispensing machine designed for the study of free-operant lever pressing performance of children. The coding subtests of theWISC for both younger and older children were also employed. The 42 males and 42 females were randomly assigned to one of three conditions: high frustration (HF), low frustration (LF), or no frustration (NF). There was an equal number of boys and girls in each group. After completing the original coding subtest, each S was seated in front of a "marble game" and instructed to press down on the key to his left which resulted in the release of either a white or a blue marble. S was told to place the blue marbles in the inserts on the board to his right, while the white marbles were to be put in a "throw away" box, also to S's right. High frustration was defined as the interruption of behavior when S was close to completing a desirable goal. For the low frustration group, reward was withheld without any goal being specified.

Results

Prior to the initiation of the experimental conditions, there were no significant differences in coding performance between males and females. Each S's score on the first administration of thecoding subtest was subtracted from his score on the second test. The difference scores were then analyzed by means of a treatment by levels design. The main effect of frustration was not significant, whereas the interaction between degree of frustration significantly affected the performance of only boys. Comparisons among the three male groups showed a significantly greater decrement in performance for the HF than for the NF condition. While not statistically significant, the data for the boys reflected a trend in the direction of poorer performance forthe HF than for the LF group and a lower performance level for the LF than for the NF group. Under high frustration males showed a significantly greater decrement in performance than did females.

Conclusions

The findings of the present experiment confirm, in part, those obtained by Barker, Dembo, and Lewin. That is, the conditions of frustration led, for the male Ss, to a decrement in perceptual-motor performance. Of course, this interpretation depends upon equating the decrease in "play constructiveness" of the previous study with the perceptual-motor task of the present experiment. Barker, Dembo and Lewin interpreted their results as evidence that frustration results in regression to an earlier stage of development and to the more primitive ("less constructive") performance characteristic of that earlier stage. However, both their results and the present findings may be as easily interpreted as reflecting an increase in the probability of competing responses resulting from frustration, or inattention to the postfrustration task due to distractions from the "more desirable" play area. Apparently, for the females, the effects of high frustration served to enhance performance by increasing speed without increasing errors.

68. Solomon, A., & Pangle, R. Demonstrating physical fitness improvement in the EMR. Exceptional Children, 1967, 34, 177-181.

Rationale

Experimental research has shown that physical proficiency can be improved in the retarded. In this respect, the evidence to date is conclusive and overwhelming. An interesting question at this point, however, and one which has not received a great deal of attention in the literature, is that relating to extent of improvement and comparison of the retardates' achievement levels after participation in physical education with those of their non-retarded peer groups. For the retardate to significantly improve a given proficiency is one thing; for this gain to be such as to permit a favorable comparison with the nonretarded CA normative group is quite another matter.

Subjects

Ss who participated in the study were 42 boys (24 experimental and 18 control) whose IQ scores on the 1937 Stanford Binet ranged from 49 to 85. The CA's and MA's of the subjects varied from 13-5 to 17-3 and 7-2 to 12-2, respectively. For the most part, subjects were representative of lower socioeconomic backgrounds.

Method

Measures of physical fitness were obtained before and after an eight week program of planned and progressive physical education activities. The daily instructional period (45 minutes) was divided into three segments of approximately 15 minutes each. Generally, the first 15 minutes consisted of warm up and calisthenic drills; the second period was devoted to self testing, dual and relay activities; and the final 15 minutes were given over to teaching skills and participating in stunts and games. A variety of activities were incorporated throughout the study, most of which are to be found in current curriculum texts. Followup data were also collected six weeks after the termination of the experimental program. Physical fitness was assessed by using three items of the AAHPER Youth Fitness Test. All conversions of raw scores into percentile ranks were made using the subject's CA in conjunction with published AAHPER normative data. This means that the retarded subjects of this study were compared with nonretardates of comparable age. Such a comparison imposes an obvious handicap for the retardate.

Results
Pretest data reflect the retardate's characteristically poor initial performance levels with respect to tests of fitness. Data obtained following the eight weeks of structured physical education experiences--and again six weeks after the experiment's termination--indicated substantial improvement. On two of the variables (chins and 50-yard dash), posttest performance levels did not differ significantly from expectations for the nonretarded CA group. Improvement in terms of situps and predicted AAHPER total score, on the other hand, exceeded the performance expectations of normal children. That is to say, on these two variables, subjects improved their performance levels from a point of "significantly inferior" to that of "significantly superior," when compared with the age equivalent nonretarded normative data group. Distributions of followup performances reveal a totally unexpected stability of physical fitness gains demonstrated over the experimental period. Six weeks after the end of the study proper, subjects continued to demonstrate significant improvement over pretest performance. Moreover, on two variables (situps and predicted AAHPER mean total score) subjects achieved significantly better than what would ordinarily be expected of their nonretarded CA comparison group. Such a finding suggests the potential capability of the retardate to achieve well along a dimension of physical proficiency.

Conclusions
Results of this investigation indicate that physical fitness of educable retarded boys can be improved through planned and systematic physical education experiences. Moreover, this improvement is apparently not a spurious gain, butcan be demonstrated following a six week post experiment interval. The importance of these findings it is thought, lies not so much in the demonstrated improvement, but rather in the extent of improvement. As the data indicate, subjects in this study evidenced the capability of performing equally as well as--and in some instances superior to--their CA nonretarded comparison group on four measures of physical fitness.

69. Stevenson, H.W., & Cruse, D.B. The effectiveness of social reinforcement with normal and feeblemindd children. Journal of Personality, 1961, 29, 124-135

Several recent studies have investigated the effectiveness of social reinforcement in modifying the performance of children in repetitive motor tasks. The introduction of social reinforcers has been found to increase the frequency of the reinforced response and to be more effective following social deprivation than following satiation. The level of response has been found to be increased to a greater degree by social reinforcement for institutionalized children than for normal children, and to be affectd by the degree of preinstitutional social deprivation experienced by feebleminded Ss.

Experiment I

Rationale

The purpose of the first study was to investigate the effectiveness of social reinforcement in modifying performance over a five-day period.

Subjects

The Ss were 30 institutionalized feebleminded children and 30 normal children. The mean CA of the feebleminded Ss was 14.2 years and the mean MA 6.1 years. The normal Ss were chosen so that their average MA would be comparable to that of the feebleminded Ss. The average CA of the normal Ss was 5.2 years.

Method

Three experimental conditions were employed: a) a reward condition in which E made supportive comments concerning S's performance; b) a condition in which E was attentive to S's performance but made no comments; and c) a condition in which E instructed S and left the room during S's performance. The three conditions made it possible to determine the degree to which the supportive comments were effective in modifying behavior, and also the degree to which E's presence was capableof sustaining performance. The retesting of Ss over a five-day period provided a more sensitive test of the effect of such variables than would be permitted within a single testing. The task was a marble sorting task with simple fine motor requirements.

Results

The results indicated striking differences between the performance of normal and feebleminded children. The performance of the normal children differed in the three experimental conditions, but the performance of the feebleminded children did not. The condition where E left the experimental situation proved not to be satisfactory for testing the feebleminded Ss. The E's leaving the room resulted in the S's failing to comply with the rules of the game. The feebleminded Ss had a higher level of response than the normal Ss in the two conditions where E was present. It was expected that the conditions would be ordered so that the highest level of response would occur in condition R and the lowest in condition Ab. This was not found for the feebleminded Ss, but was found forthe normal Ss.

Conclusions

The finding that institutionalized feebleminded Ss will play a simple, repetitive game for a longer time than normal Ss is in accord with the findings of an earlier study. The failure of the experimental conditions to produce differences in performance by the feebleminded groups, however, does not add strength to the earlier interpretation thatadult contact and support are more reinforcing for feebleminded than for normal Ss because of the latter Ss' greater deprivation of adult contact and approval.

Experiment II

Rationale

The second study had two purposes: to determine the effects of additional conditions on the behavior of Ss in the task used in Experiment I; and to determine whether different results are obtained when groups of normal Ss near the CA of the feebleminded Ss and when groups of normal Ss of the same MA as the feebleminded Ss are tested.

Subjects

The Ss were 36 institutionalized feebleminded children and 72 normal children. The mean CA of the feebleminded Ss was 15.0 years and the mean MA, 6.1 years. One group of normal Ss was chosen on the basis of CA and another on the basis of MA. Half of the normal Ss were from sixth and seventh grades of an elementary and junior high school and had an average CA of 12.4 years. Half of the normal Ss were from kindergarten groups with an average CA of 5.2 years and an estimated MA of 6.2 years.

Method

Four experimental conditions were used: a "reward" condition and an "attentive" condition identical to those used in Experiment I; a condition in which E left S but remained in the testing room; and a condition in which E made critical comments to S about his performance. The condition in which E made negative comments was introduced to test the prediction that social criticism would suppress performance to a greater degree in feebleminded than in normal Ss.

Results

The results indicate that the differences in performance between normal and feebleminded Ss previously obtained cannot be attributed to increased skill associated with CA. The older normal Ss actually performed at a lower level than the younger normal Ss in conditions R and At. The critical comments seemed to be effective with all Ss.

70. Stoneman, Z., & Keilman, P.A. Competition and social stimulation effects on simple motor performance of EMR children. American Journal of Mental Deficiency, 1973, 78, 98-110.

Rationale

The purpose of this research was to study the effects of social stimulation and competition in EMR children. Social stimulation was defined as the presence of other children working on the same task. Competition was defined as directly instructing the children to attempt to exceed the performance of others.

Subjects

Forty EMR children, (20 girls and 20 boys), served as subjects. Their IQ and CAs ranged from 43 to 75 (mean=63.7) and from 8 to 14 years (mean= 11.1), respectively.

Method

The design of the present study involved the comparison of performance on the Dots and Maze tasks as a function of the presence or absence of competition, the presence or absence of social stimulation and sex. In the groups with social stimulation present, five subjects of the same sex were seated at desks placed about 1 m apart in a circle. In the groups without social stimulation, each subject was seated alone at a desk. In order to evaluate the overall effect of competition and social stimulation on performance, an efficiency rating was calculated for both tasks by subtracting the number of errors from the total number of responses from each subject on each task. Errors were defined as crossing any of the points on the Maze task or crossing the sides of any triangle on the Dots task. A 2X2X2 (Competition X Social Stimulation X Sex) analysis of variance was performed on the efficiency rating data for each task.

Results

In the Maze task, those children with competition present performed significantly better than those without competition. There was also a significant Social Stimulation X Sex interaction. Females performed significantly higher than did males only under the condition of social stimulation absent. Although females' performance did not differ significantly as a function of the absence or presence of social stimulation, the males did perform significantly higher in the presence of social stimulation than they did in its absence. In the Dots task, those children with social stimulation performed significantly better than those without it.

Conclusions

The facilitative effects of competition and social stimulation were demonstrated in EMR children, but were found to be highly task dependent. The Social Stimulation X Sex interaction is interesting in that the females did significantly better than the males in the absence of social stimulation, while the two sexes did not differ significantly when working in groups. It might be that females generate motivation from within the self while males use the presence of others to facilitate their performance.

71. Talkington, L.W. Frostig visual perceptual training with low-ability-level retarded. *Perceptual and Motor Skills*, 1968, *27*, 505-506.

Rationale

The purpose of this study was to consider the applications of visual perceptual training to lower ability level retardates.

Subjects

Ss were 100 severely and profoundly retarded students. IQ range was from 17 to 48 and CA range from 84 to 220 months.

Method

All Ss were administered the Developmental Test of Visual Perception which yields scores in the following five areas: 1) eye-motor coordination; 2) figure-ground discrimination; 3) figure constancy; 4) position in space;

5) spatial relations. Two groups were selected randomly: Group E (training) and Group C (no training), with 50 Ss in each group. After initial testing (T) the E group received 3 months of perceptual training with the Frostig-Horne materials for approximately 1 hour daily, five days per week. The C group participated an equal amount of time in preschool classroom activities such as coloring, stories, music, puzzles, and games. Finally, both groups were retested with the developmental test.

Results
The E group evidenced significantly greater gains on the test-retest difference scores in all areas.

Conclusions
The indication from the present study is that special training in visual perception can improve the severe and profound retardate's skills in discrimination, coordination, and spatial manipulations. Perhaps the most significant feature of this investigation is that the results were achieved with a severely retarded group, generally considered untrainable in academic areas. Visual perceptual training seems both feasible and beneficial for lower ability level retardates, and further research with the Frostig-Horne materials is warranted.

72. Talkington, L.W., Altman, R., & Grinnell, T.K. Effects of positive and negative feedback on the motor performance of mongoloids. Perceptual and Motor Skills, 1971, 33, 1075-1078.

Rationale
The cited reports on the facilitative effects of negative consequences applied to errors in the modification of behavior patterns have provided consistent results for widely divergent tasks and designs. The current study represents an exploratory attempt to define certain parameters for trainable retarded persons, using a design which allows comparison of the "negative consequences for errors" and "positive ones for correct responses" on a perceptual motor task. Specifically, the relative efficacy of types of verbal consequences on marble-dropping performance by trainable Ss was examined.

Subjects
Thirty male and 30 female retardates carrying a classification of mongolism (Down's Syndrome) served as Ss. Ranging in age from 11 to 17 years, and in measured IQ from 16 to 53.

Method
Ten male and 10 female Ss were randomly assigned to each of three treatment groups. Group I received positive verbal feedback for correct responses (that's right"), Group II received negative feedback for errors ("that's wrong"), and Group III received positive and negative feedback for correct responses and errors, respectively ("that's right" or "that's wrong" depending on S's response). Ss were required to learn a simple alternation marble-dropping task to a criterion of 10 correct, consecutive alternations.

Results

A significant difference was found between treatment groups. No performance differences were observed between male and female Ss, nor was the sex X treatment interaction significant. The group with negative feedback on errors achieved performance criterion in significantly fewer trials than either the group with positive feedback for correct responses or with the combined feedback. Also, the combination of negative and positive feedback proved more effective than positive feedback for correct responses alone.

Conclusions

These results are consistent with Zigler's failure-avoidance hypothesis suggesting that *motivational* variables associated with each particular treatment may have served as performance determinants over and above the informational aspects of the conditions. Zigler has suggested that retardates are characterized by an outer-directed problem-solving approach which depends heavily on cues from others. This hypothesis assumes a high incidence of failure for retarded in their attempts to cope with their environment and the subsequent development of a failure-avoidance motivational system. The dependency on external cues is posited as serving to reduce failure by retardates. The application of this failure-avoidance hypothesis to the present findings suggests that "negative feedback" (calling attention to errors) has greater motivation significance than "positive feedback" (calling attention to correct responding) and thus facilitates learning.

73. Taylor, G.R. Evaluation of the effect of a physical education program upon minimum levels of muscular fitness of trainable mentally retarded boys. *Training School Bulletin*, 1972, *69*, 49-53.

Rationale

Kephart stated that muscular responses are the earliest behavioral responses of the human organism and that all behavior is basically motor. He advocated activities stressing laterality and directionality, which includes the balance board, walking board, and activities stressing locomotion. This model served as the theoretical framework for the study, as well as the rationale for the physical education training program. The purpose of this study was to determine the effects of a concentrated physical education program on minimum levels of muscular fitness of TMR boys.

Subjects

Ss for this study involved 35 TMR boys. A group of 35 TMR boys enrolled in the same school district was selected as a control group. Ss ranged in age from 10 years to 16 years, in IQ from 30 to 54, and their MA ranged from 4 years to 8 years. Ss were ambulatory, toilet trained, free of severe personality problems, and neurological impairments.

Method

The Kraus-Weber Test of Minimum Muscular Fitness was administered on a pre-post basis to determine the extent of minimum muscular fitness to proficiency. The Kraus-Weber Test consists of six items that propose to indicate the level of strength and flexibility for certain key muscle groups. The six components of the Kraus-Weber Test include the following sub-tests: 1) three for abdominal muscles; 2) two for the back muscles; and 3) one for flexibility of the back and hamstring muscles. The program was conducted three days a week for one hour per day. It provided a wide variety of gymnasium and playground activities all aimed at improving the three basic motor skills, walking, running and jumping. The control subjects received no formal physical education instruction other than the free play during recess and recreational periods.

Results

Post test results show that the experimental group out performed the control group at the 1 percent level. Thus, the hypothesis which stated that the experimental group would be significantly superior to the control group on minimum levels of muscular fitness over a six month period was supported.

Conclusions

The results of this study suggested that an organized physical education program for TMR boys did significantly improve their muscular fitness as measured by the Kraus-Weber Test.

74. Webb, R.C. Sensory-motor training of the profoundly retarded. American Journal of Mental Deficiency, 1969, 74, 283-295.

Rationale

Profoundly retarded individuals present gross underdevelopment in four general areas of behavior: Level of awareness - some of these children may be so inert that they give no apparent response to sensory stimuli. Movement - with disturbance in arousal level is usually found gross impairment in total body movement. Inert children scarcely move and other youngsters who are hyperactive move constantly. Manipulation of the Environment - impaired awareness and motor development make it extremely difficult for the totally disabled child to alter his physical and social environments in order to gain satisfaction of first physical, and then, emotional needs. Posture and Locomotion - the grossly retarded child has great difficulty in achieving the upright position against gravity quickly achieved by the normal youngster.

Subjects

The 17 males and 15 females ranged in CA from 2 1/2 to 17 1/2 years with the median of 9 years, 11 months. Social ages, as computed from the Vineland Social Maturity Scale (VSMS), ranged from 2 to 21 months. All Ss were diagnosed as having encephalopathy from known or unknown causes.

Method

The period of training for these 32 subjects ranged from 5 1/2 to 10 1/2 months with the median 8 months. The subjects were seen for an hour a day, four days a week. Training was designed to effect change in the areas of awareness, manipulation of the environment, movement and posture and locomotion. Before training each child was given a sensory-motor evaluation to determine the levels of his sensory integration and his motor performance; the levels of development in the four behavior areas was recorded on the AMMP Index. This was a rating scale developed by the author to assess sensory-motor development in the profoundly retarded. The AMMP Index includes 50 items: Awareness - 16; Movement - 10; Manipulation of environment - 10; Posture and locomotion - 12.

Results

In regard to the individual AMMP indices the Movement scores yielded the greatest mean change while the mean changes in Awareness, Manipulation of Environment, and Posture and Locomotion followed in descending order. About half of the subjects showed increased Awareness; all children gained improved Movement patterns; two-thirds gained in reaching and grasping objects; all children who initially did not relate to adults gained this ability; and there was some gain in Posture and Locomotion in all but one child. This summary strongly indicates that the sensory-motor behavior of most of these profoundly retarded children, as delineated by the AMMP Index, did improve during the ten month period of training. Comparison of pre and post treatment Social Ages gave a mean difference of two months.

Conclusions

The comparatively greater mean differences of pre and post scores in the area of Movement presents material for interesting speculation. Analysis of the training techniques for the four areas reveals the fact that only in Movement were the techniques imposed upon the uncooperating child. Therapy in other areas encouraged more Awareness through coaching him to respond voluntarily to outside stimuli, more Manipulation through voluntarily reaching and grasping, and more Locomotion through actively moving from his established posture. In the latter areas he reacted with his own motor response and so his progress may have been slower. From this study the experimenters cannot estimate the training period needed to effect behavior changes and the optimum age at which training should be initiated. They do know that the younger subjects in their groups made the greatest improvement. It seems apparent that the relative freedom of younger children from deformities and disruptive behavior patterns is more conducive to the development of new sensory-motor responses.

75. Weninger, O., Rotenberg, G., & Henry, A. Body image of handicapped children. *Journal of Personality Assessment*, 1972, *36*, 248-253.

Rationale

Body image is a term which refers to the body as a psychological experience, and focuses on the feelings and attitudes of the individual toward his own body. In the present study, the aim was to determine whether there would be significant differences in the body image among groups of institutionalized, physically handicapped children and physically normal children.

Subjects

Ss in Group 1 were institutionalized spina bifida cases, confined to either wheel-chairs or stretchers. Ss in Group 2 were spina bifida cases living at home. Although these children lived with their families, their physical illness was comparable to that found in Group 1. Ss in Group 3 were normal, non-handicapped children, living at home and matched for age and sex with the control group. Intellectually, all the children functioned withing the normal range or better as noted on previous intelligence testing and academic performance. Ss in all three groups were matched as closely as possible. Children ranged in age from 11 to 17 years.

Method

A make-a-person task was individually administered. The three-dimensional figures created by the Ss were duplicated in exact proportion on graph paper to facilitate measurement and to obtain pertinent data.

Results

There is no statistically significant difference between the figure measurement of children with a physical handicap living at thome and normal school children, but there is a statistically significant difference between the figure measurement of institutionalized physically handicapped children and the other two groups of children. In all measurements the children who are physically handicapped and institutionalized made smaller figures.

Conclusions

The results of the present study indicate that institutionalized, handicapped children do have a different way of regarding themselves and that this difference in self-perception may be measured by their different performance in making human figures when their constructions are compared with those of children with the identical handicap who spend all butschool hours at home with their families. The authors hold the factor of institutionalization accountable for the obvious difference in performance. Lack of consistency in parental figures and limited living experiences appear to be certain of the important variables underlying the underdeveloped body image schema produced by the institutionalized physically handicapped child.